RMU+6036 1 VOL 2 SV



DRANETZ

626-RMU

626-RMU-1/626-RMU-3

626-RMU-3A/626-PA-6036

Vol. 2

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**WARNING**

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electric Code (ANSI C1) or any other requirements, or both, which may be applicable to the user.

Installation, operation, and maintenance should only be performed by qualified personnel.

# TM-111200

## VOLUME 2 -- SERVICE MANUAL

## REMOTE MONITOR UNITS: 626-RMU-1, 626-RMU-3, 626-RMU-3A

## AND

## REMOTE MONITOR INTERFACE ADAPTER: 626-PA-6036

1 September 1985

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Note: Refer to Volume 1 (Operator's Manual) of TM-111200 and TM-111236 for the installation and operation instructions.

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# VOLUME 2
# SERVICE MANUAL

## REMOTE MONITOR UNITS AND INTERFACE ADAPTER PLUG-IN

## SECTION IV
## THEORY OF OPERATION

### 4.1 SCOPE

Volume 2 of TM-111200 provides the service, calibration, and maintenance instructions for three models of the Remote Monitor Unit and the 626-PA-6036 Interface Adapter plug-in. It's divided into four sections: (IV) THEORY OF OPERATION, (V) MAINTENANCE AND CALIBRATION, (VI) REPLACEABLE PARTS LIST, and (VII) SCHEMATICS AND GENERAL ASSEMBLY. (Roman Numerals IV through VII, and their corresponding subsections, are standard Volume 2 section numbers in new Dranetz Service manuals.) See Volume 1 of TM-111200 and TM-111236 for the installation and operation instructions.

### 4.2 INTRODUCTION

The three Remote Monitor Unit models are the 626-RMU-1, 626-RMU-3, and 626-RMU-3A. The three models are similar and for simplicity, the terms "Remote Monitor" and "RMU" will be used when referring to common features or operations. (See figure 7-1 for the RMU main assembly drawing.) The 626-PA-6036 Remote Monitor Interface Adapter plug-in does not require maintenance or calibration, and is referred to as the "6036 plug-in." The 6036 plug-in's assembly drawings and schematic diagram are located in Section VII, figures 7-5, 7-6, and 7-11.

### 4.3 GENERAL FUNCTIONAL DESCRIPTION

The RMU consists of four major sections, each described below:

Analog. The analog section contains input attenuators, filters, and peak detectors, resulting in signal voltages which correspond to the ac level, high frequency impulses, etc.

Digital. The digital section contains a microprocessor which reads the appropriate voltages once per input cycle, using an analog-to-digital convertor, and determines if any disturbances have occurred. The digital section also contains a communications interface, cartridge interface, and LED display circuitry (see figure 7-10 for the LED indicator board schematic).

Clock/Memory. The clock/memory section stores all of the event, threshold, and time data. It contains a battery backup which is activated if the RMU's power is cut off.

Power Supply. The power supply provides the necessary operating voltage for the digital, analog, and logic circuits. It's designed to function over a wide input voltage range.

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### 4.3.1 RMU Circuitry

The RMU circuitry is located on three printed circuit boards: analog board, digital board, and LED display board. (See figure 7-7 for the interconnecting wiring diagram.) The analog board contains the front-end circuitry and most of the analog circuits, as well as the entire clock/memory section and some power supply components. The digital board contains most of the digital section, plus some of the analog circuitry. The LED display is located on its own board behind the front panel. The fuse, switches, interface connectors, and power supply transformer are all mounted to the rear panel.

## 4.4 DETAILED CIRCUIT DESCRIPTION, ANALOG BOARD

The analog board's block diagram is located in figure 4-1.

### 4.4.1 Power Supply

The power supply is basically a conventional linear design. The power line is filtered (L1, L2, C71, etc.) prior to being applied to transformer T1. Fuse F1 provides short-circuit protection. S1 is the ON/OFF switch; S2 connects the primary windings of T1 in parallel for 115V nominal line voltage, and in series for 230V operation. A separate pole is used to send a logical high to the digital board whenever the unit is turned OFF.

One of the secondary windings is full-wave rectified and fed to a positive 5V regulator, U22. The center-tapped secondary winding is full-wave rectified, and then fed to adjustable positive and negative regulators.

R64 is adjusted for U21 to supply +15 volts, and R63 is adjusted for U20 to supply -15 volts. The unregulated input voltage to U21 is sent to the digital board for power loss detection. The supply will output up to 500 milliamps at +5 volts, and 250 milliamps at +15 and -15 volts, for a total of 10 watts.

### 4.4.2 Analog Circuitry

**NOTE**

Descriptions concerning Phase "A" apply to single-phase units. Descriptions concerning Phases "A," "B," and "C" apply to three-phase units.

The analog board schematic (figure 7-8) indicates where op-amp pinouts differ from those in Phase "A." In the 626-RMU-1, the voltage at the power cord receptacle is internally connected to the Phase "A" front-end circuitry. Throughout the following description, IC pin numbers appearing in brackets indicate where the important signals appear. For the parts locations, refer to figure 7-2, the analog board assembly.

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#### 4.4.2.1 AC Line Voltage

The measured ac line voltage is attenuated [U11, pin 1] and passed through a four-pole, low-pass filter [U7A, pin 7]. It's then sent to the digital board for further processing. C5A removes any dc offset introduced by the circuitry. R23A is adjusted to null out the 60 Hz common mode response. R15A is the ac level calibration trimmer.

#### 4.4.2.2 Impulse Measurement

For impulse measurement, both sides of the input are attenuated by capacitive voltage dividers and fed to a high frequency differential buffer [U10, pin 7]. Resistors R21A and R22A give the buffer a single-pole, high-pass characteristic. The buffer is followed by a two-pole, high-pass section, resulting in a three-pole filter [U9AB, pin 1].

The filtered signal passes through a high-speed, full-wave rectifying peak detector [U2AB, pin 1], then to a low-droop peak detector [U1A, pin 1], and finally up to the digital board. C22A is adjusted to null out any common mode impulse response. R5A is the impulse calibration trimmer.

#### 4.4.2.3 626-RMU-1 and -3 Neutral-to-Ground Voltage

For the 626-RMU-1 and -3, neutral-to-ground voltage is attenuated by an all-pass divider [U10, pin 1], then sent to a full-wave rectifying peak detector, and finally up to the digital board. R74 is adjusted to match a 60 Hertz response with a high frequency response. R71 is the neutral-to-ground calibration trimmer.

#### 4.4.2.4 626-RMU-3A Neutral-to-Ground Voltage

For the 626-RMU-3A, differential inputs are provided for neutral-to-ground monitoring. The measured voltage is attenuated by an all-pass differential amplifier [U13, pin 7], and then fed to U10, pin 3. (At this point, the circuit is identical to the 626-RMU-1 and -3.) C45 is adjusted to null out any common mode response. R71 is again the neutral-to-ground calibration trimmer.

#### 4.4.2.5 626-RMU-3A DC Input

The dc input of the 626-RMU-3A is attenuated by an all-pass differential amplifier [U13, pin 7]. DC level is measured by low-pass filtering and half-wave rectifying of the attenuated signal. The signal at the cathode of CR7 is sent to the digital board. If negative dc voltage is applied to the input, the unit will measure it as 0.0 volts, because of the half-wave rectifier.

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Impulses in the dc channel are measured by passing the attenuated signal through a two-pole, high-pass filter [U9CD, pin 7], on to a full-wave rectifying peak detector, and finally up to the digital board. C45 is adjusted to null out common mode impulse response. R35 is the dc level calibration trimmer. R3A is an offset trimmer.

### 4.4.3 Clock/Memory Section

Power to U15, U16, U18, and U19 is provided through diodes connected to the batteries and the +5V power supply. U14 is powered directly from the batteries. Battery power is supplied by three 1.2V nickel-cadmium cells connected in series. While the unit is powered, the voltage drop across R50 results in a near constant 25mA charging current. When fully charged, battery voltage is typically 4 volts. J1 may be set to disconnect the batteries during assembly, repair, or long-term storage.

#### 4.4.3.1 Microprocessor Reset Circuit

While the unit is OFF, or if the +5V power supply drops, the output of the comparator [U13, pin 16] is high, thus disabling tri-state buffer U19. This prevents the clock and memory chips from being accesses, and assures the lowest possible power consumption. The microprocessor reset line is pulled low during this time by a pull-down resistor on the digital board. This prevents the microprocessor from trying to run with a low power supply voltage. Upon "power-up," there is a slight delay before the tri-state buffer is enabled. (This allows the power supply to stabilize before releasing the reset line.)

#### 4.4.3.2 Microprocessor Memory Access

During every microprocessor memory access cycle, U17 latches the low-order address byte from the multiplexed address/date bus. U16 appears to the microprocessor as a 2k-byte block of RAM memory. U15 is also a 2k-byte RAM IC, but is decoded in such a way that only 128 bytes of address space are used to access it.

The microprocessor selects one of 16 banks of 128-bytes by writing the proper data to latch U7 on the digital board. The time clock IC, U14 (which also contains 50 bytes of RAM) is programmed to interrupt the microprocessor once per second as the time is updated. Time updates continue while the unit is OFF. C52 is the time clock oscillator calibration timer.

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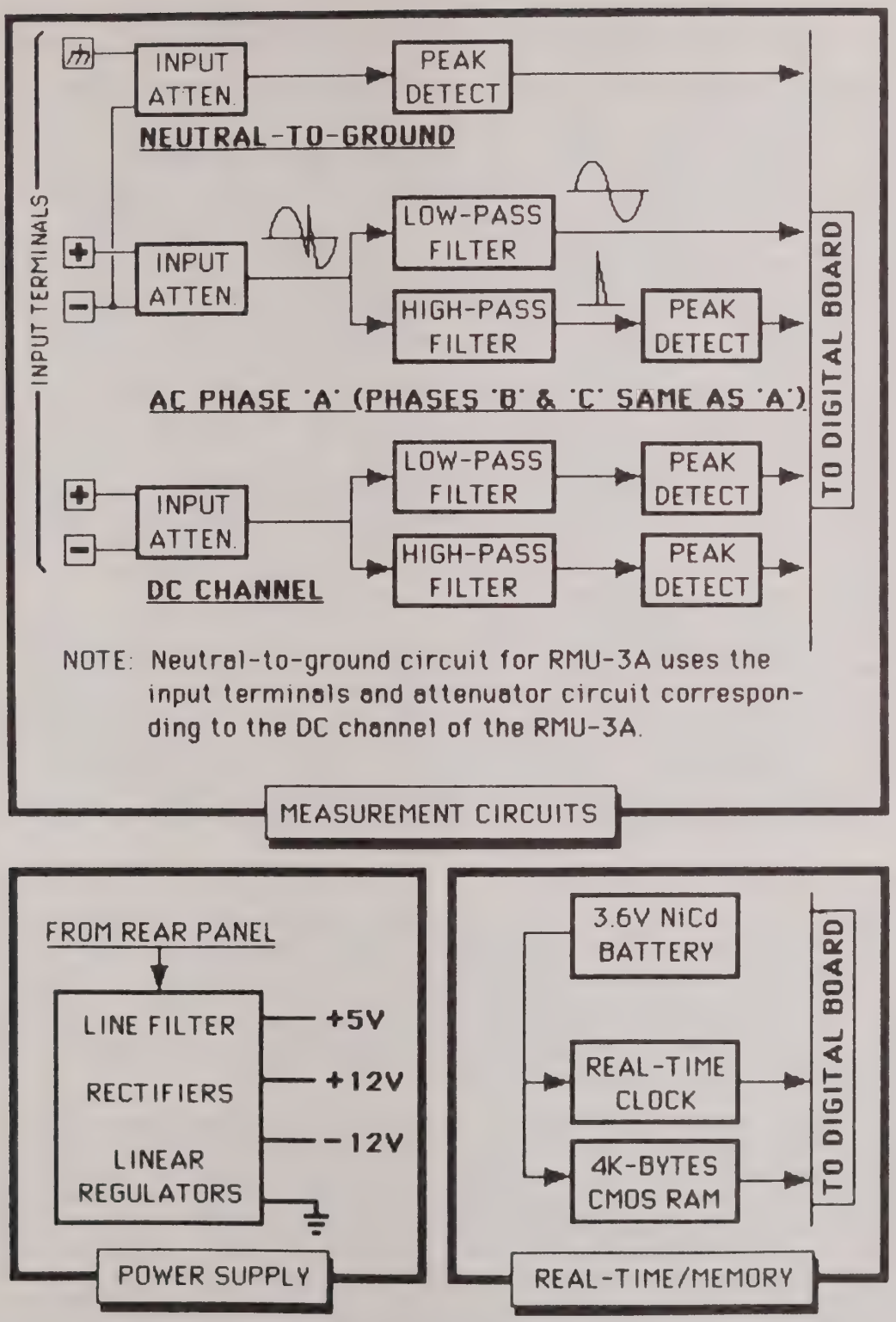


Figure 4-1. Block Diagram: 626-RMU Analog Board

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## 4.5 DETAILED CIRCUIT DESCRIPTION, DIGITAL BOARD

The digital board's block diagram is located in figure 4-2.

### 4.5.1 Analog Circuitry

The low-pass filtered ac signals are full-wave rectified, peak detected [U32A, pin 6], and sent to the analog switches. For Phase "A," the filtered signal is used to determine zero-crossings using a comparator [U17, pin 2]. The rectified dc level and the neutral-to-ground peak detector on the analog board are connected to a low-droop peak detector, and from there to an analog switch. The ac impulse peak detectors are followed by track-and-hold amplifiers before connection to the analog switches. (See figures 7-3 and 7-9 for the part locations and schematic diagram.)

Altogether, there are nine switches which form an analog multiplexor corresponding to ac levels, ac impulses, neutral-to-ground, dc level, and dc impulse. Note: Only three of these switches are used for the 626-RMU-1. The microprocessor selects these inputs one at a time for analog-to-digital conversion, by writing the appropriate data to latches U7 and U8.

The unregulated power supply voltage from the analog board is then fed to a comparator. R37 is adjusted so the comparator will output a logical high whenever less than 90 volts are applied to the RMU's power supply. When power to the RMU is lost or turned OFF, the ±15V power supplies go down before the +5V power supply. Diodes CR10 and CR11 insure that the comparator has enough power to signal a power loss before the logic supply is lost. This permits an orderly software shutdown.

### 4.5.2 Digital Hardware

The microprocessor IC, "6805," provides two 8-bit I/O ports, some internal RAM, and an internal timer. The low-order byte of the address bus is multiplexed with the data bus, so U16 is used to latch the low-order address byte during each memory access cycle. The lower half of the 8k-byte address range is used for the RAM, time clock, I/O, control latches, and a status port. The upper half is used for software in the PROM.

If just one PROM were used, only 4k-bytes of program would be possible. To expand the amount of program space, any of three PROMs may be selected by the microprocessor to reside in the same 4k-byte area. The 6805 "powers-up" with its I/O ports configured as high impedance inputs, allowing R8 to pull bit 7 of port A high [U1, pin 7], thus forcing the program to start from the PROM at U2. The software configures the I/O ports in such a way that by bringing bit 7 of port A low, the 6805 can execute programs from PROMs at either U3 or the cartridge, depending on the state of the control latch outputs [U33, pins 2 and 19]. Port B and four lines of port A are used to read and control the 10-bit A/D convertor, U4.

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#### 4.5.2.1 6805 Interrupts

During normal operation, the 6805 may be interrupted from any of five sources. A high level on one of the data inputs of the priority encoder, U5, will drive the interrupt request line low [U1, pin 2], and generate a priority code. This priority code is then read by the 6805 using three of port A's I/O lines.

If more than one source tries to interrupt the 6805, it (they) will be recognized in descending order of importance. Highest priority is given to the ON/OFF switch and the power loss detector in order to allow the 6805 to shut down properly before the logic supply becomes too low.

Other sources of interrupts are the communications port, real time clock, and zero-crossings of the input to Phase "A." The priority encoder may be disabled by writing the proper data to latch U7 so that pin 5 of U5 is brought low. In addition to external interrupts, the internal timer is set to interrupt the 6805 at 10 millisecond intervals.

### 4.5.3 Communication

An ACIA (Asynchronous Communications Interface Adapter) is used to perform parallel-to-serial and serial-to-parallel conversions. The baud rate is software programmable, and is usually kept at 9600. If a modem cartridge is present, 300 baud will be used during telephone communications. Serial input data may be received either from the communications port on the rear panel, or from the modem cartridge, depending on the state of U7, pin 5. Serial output data will be transmitted to both locations. The logic levels at the port are RS-232 compatible.

### 4.5.4 Measurement Cycle

The track-hold amplifiers following the ac impulse peak detectors are normally tracking [pin 6 of U30, U29, and U22]. When a negative going zero-crossing occurs on Phase "A," U17, pin 2 will go high, causing the output of a latch to go high [U15, pin 9]. This in turn clocks another latch high [U15, pin 5]. This signal causes the analog switches of the track-hold amplifiers to open [pin 16 of U18, U19, and U20], starts a one-shot to reset the ac impulse peak detectors [U16, pin 13], and interrupts the 6805 with a priority code 3. The 6805 will then use the A/D convertor to read nine voltages, selecting one at a time by enabling one of the analog switches. After all have been read, the 6805 writes to a location which causes pin 1 of U15 to go low. This starts a one-shot to reset the remaining peak detectors, allows the track-hold amplifiers to track, and removes the interrupt.

The 6805 then resets the first latch [U15 pin 13], and the cycle begins again. If no zero-crossing occurs on Phase "A" after 40 milliseconds, the 6805 will manually trigger the hardware and continue to take readings at 20 millisecond intervals.

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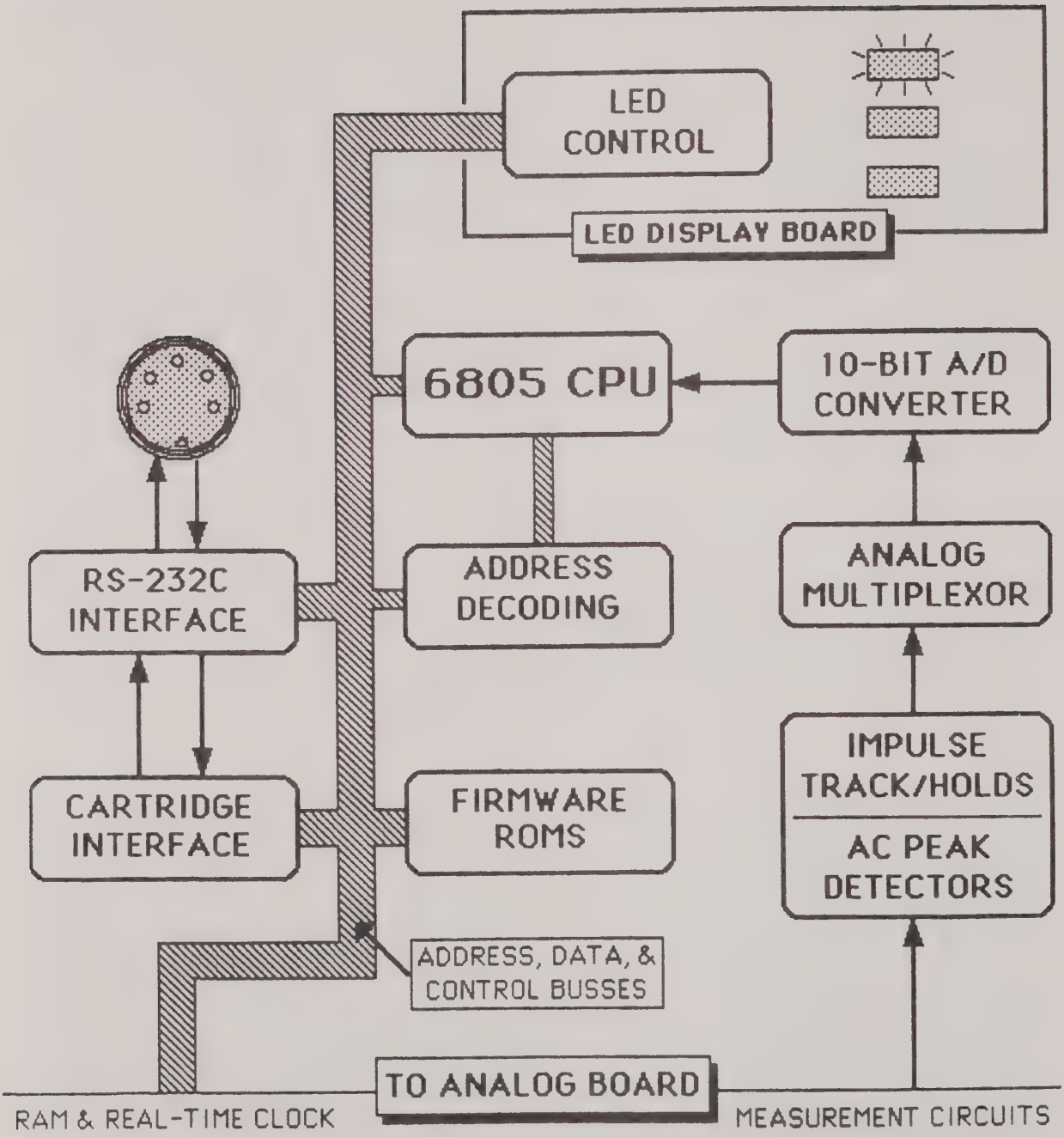


Figure 4-2. Block Diagram: 626-RMU Digital Board & LED Display

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# SECTION V
# MAINTENANCE AND CALIBRATION

## 5.1 GENERAL

This section provides the maintenance and calibration instructions for the 626-RMU-1, -3, and 3A. (The 6036 plug-in does not require maintenance or any calibration.)

### 5.1.1 Maintenance

The only required maintenance for your RMU is its calibration, which should be done every 12 months. You may return the RMU to the factory for calibration (contact the Dranetz Service Corporation for instructions: Tel. No. 201-287-2535, TWX: 710-997-9553, Telex: 499-7808, Cable: DRANETZ), or you may calibrate the RMU on your own with proper equipment by following the CALIBRATION PROCEDURE.

### 5.1.2 Service Warnings

**WARNING**

The following calibration instructions are intended for qualified personnel ONLY. To avoid electrical shock, DO NOT perform any service other than that contained in your Operator's manual unless you are qualified to do so.

DO NOT attempt internal service or adjustment unless another person, capable of rendering aid and resuscitation, is present.

Read Instructions Carefully

Because of possible shock or fire hazard, DO NOT perform any service tasks which are beyond your qualifications. Your qualifications for performing such tasks should be self-determined.

## 5.2 CALIBRATION PROCEDURE

**CAUTION**

To prevent damage to the RMU while soldering, inserting, or removing components, set J1 on the analog board so that the shorting bar is between pins 2 and 3. Remember, however, to move the shorting bar back between pins 1 and 2 before operating the RMU.

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### 5.2.1 Recommended Equipment

1) CRT data terminal and keyboard: Zenith Z-19;

2) Disturbance simulator: Dranetz 604A;

3) Digital multimeter: Fluke 8800A;

4) Peak-reading voltmeter: Micro Instrument 5203;

5) Variable autotransformer: Variac W8MT3;

6) Oscilloscope, 25 MHz or better, 10 megaohm probes;

7) Source of dc voltage;

8) Interface cable: Dranetz P/N 111346-G1;

9) Test Software PROM (contact the Dranetz Service Corporation for this information).

### 5.2.2 Initial Setup

626-RMU-1 (ONLY)

The 626-RMU-1 has black and white wires connecting the Phase "A" input section to the RMU's power cord receptacle.

(1) Unsolder the wires from the PC board at the input section.

**WARNING**

Tape the unsoldered wires to avoid dangerous voltage.

(2) Install two temporary black and white wires so that test signals may be applied to the Phase "A" input.

626-RMU-3, and -3A (ONLY)

(1) For your three-phase unit (626-RMU-3 or -3A), wire the barrier block so that signals may be applied simultaneously to Phases "A," "B," and "C."

(2) Set all trimmers to the center of rotation.

626-RMU-1, -3, and -3A

(Unless stated otherwise in the following procedures, all adjustments are made on the analog board.) Proceed with the following steps for all three units:

(1) Remove the PROM at U3 and install the test PROM in its place.

(2) Set the data terminal for 9600 baud.

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(3) Connect the interface cable from the RMU to the terminal.

(4) Turn ON the terminal.

(5) Turn ON the RMU.

The LED display should cycle as usual, and after a few seconds, a unit identifier message should appear on the terminal screen. The test software will respond to the pressing of three keyboard upper case letters: "C," "K," and "U."

Pressing "C" will display the ac levels and impulses for three phases: neutral-to-ground voltage, dc level, and dc impulses.

Pressing "K" will erase the unit's historical data.

Pressing "U" will display the current time and date.

In addition, pressing [RETURN] or [ENTER] halts the displays caused by the pressing of "C" and "U."

### 5.2.3 Power Supply Voltage

(1) Set R64 so that the voltage at U1A, pin 8 is +15.0 V dc.

(2) Set R63 so that the voltage at U1A, pin 4 is -15.0 V dc.

### 5.2.4 Common Mode, AC

(1) Apply 120 V ac to the "+" and "-" terminals of all ac inputs.

(2) Adjust R23A so that the signal at U11, pin 1 is at a minimum: less than 50 millivolts p-p (peak to peak).

626-RMU-3 and -3A (ONLY)

(1) For your three-phase unit, adjust R23B and R23C to minimize the signals at U11, pin 7; and U13, pin 1 (respectively).

### 5.2.5 Common Mode, Impulse

(1) Set up the impulse generator to apply 200V, ½sinewave, 10uS impulses to both the "+" and "-" terminals of all ac inputs.

(2) Adjust C22A so that the signal at U10, pin 7 is at a minimum (less than a 25 millivolt peak).

626-RMU-3 and -3A (ONLY)

(1) For your three-phase unit, adjust C22B and C22C to minimize the signals at U12, pin 1; and U12, pin 1 (respectively).

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626-RMU-3 (ONLY)

(1) For the 626-RMU-3, set up the impulse generator to apply 25V, ½sinewave, 30uS impulses to both the "+" and "-" terminals of the dc channel.

(2) Adjust C45 so that the signal at U13, pin 7 is at a minimum (less than 50 millivolts).

### 5.2.6 AC Level

(1) Apply 119.5 V ac between the "+" and "-" terminals of all ac inputs.

(2) Press "C" at the terminal to display current input voltages.

(3) Adjust R15A so that Phase "A" reads 119 volts, then slowly turn R15A until the voltage just begins to read between 119 and 120.

626-RMU-3 and -3A (ONLY)

(1) For your three-phase unit, adjust R15B and R15C for similar results on Phases "B" and "C" (respectively).

### 5.2.7 626-RMU-1 and -3 Neutral-To-Ground

(1) Set up the impulse generator to apply 150V, ½sinewave, 10uS impulses between the "-" terminal of Phase "A" and the case ground.

(2) Adjust R71 so that the largest "NEUT" reading obtained for repeated impulses is 150 volts.

(3) Disconnect the impulse generator and apply 106 V ac between the "-" terminal of Phase "A" and the case ground.

(4) Adjust R74 so that the "NEUT" reading is 150 volts.

### 5.2.8 626-RMU-3A Neutral-to-Ground

(1) Set up an impulse generator to apply 150V, ½sinewave, 10uS impulses simultaneously to both the "+" and "-" inputs of the "NEUT" channel.

(2) Adjust C45 for minimum response at U13, pin 7 (less than 50 millivolts).

(3) Reconnect the impulse generator to apply the same impulse, but this time between the "+" and "-" terminals of the "NEUT" channel.

(4) Adjust R71 so that the largest "NEUT" reading obtained for repeated impulses is 150 volts.

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### 5.2.9 Impulse

(1) Set up the impulse generator to apply 10uS, ½sinewave impulses between the "+" and "-" terminals of all ac inputs. The peak amplitude should be as high as possible (up to 1000 volts).

(2) Adjust R5A so that the Phase "A" impulse reading is correct. For the three-phase unit, adjust R5B and R5C for similar results on Phases "B" and "C" (respectively).

### 5.2.10 DC Level and Impulse for the 626-RMU-3

(1) Connect a lead from case ground to the "-" terminal of the dc channel.

(2) Connect a lead from U1A, pin 8 (+15 volt supply) to the "+" terminal of the dc channel.

(3) Adjust R35 so that the dc average reading is 15.0 volts.

(4) Set up the impulse generator to apply 25V, ½sinewave, 30uS impulses between the "+" and "-" terminals of the dc channel.

(5) Adjust R36D on the digital board so that the dc impulse reading is correct.

### 5.2.11 Power Loss Trip Point

(1) From the 626-RMU-1, remove the temporary black and white leads from the Phase "A" inputs, and reconnect the regular black and white wires from the power cord receptacle to the Phase "A" inputs.

(2) Using a variable transformer, apply 90 V ac to power the unit.

(3) On the digital board, rotate R37 fully clockwise, then slowly counterclockwise, until the logic level on U17, pin 10 goes from low to high.

### 5.2.12 Time Clock Oscillator Frequency

(1) Using a frequency counter, adjust C52 so that the period of the signal at U14, pin 21 is 30.51758 microseconds, corresponding to a frequency of 32.768 kHz.

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# SECTION VI
# REPLACEABLE PARTS LIST

## 6.1 GENERAL

The replaceable parts are listed in table 6-1 which begins below. Contained in the parts list is each part's description, identification number, reference designation, and manufacturer's code. Much of the replaceable hardware was omitted from this table. For further information on the replaceable hardware, contact the Dranetz Service Corporation.

### 6.1.1 Reference Designations

Refer to figures 7-1 through 7-6 in section VII for assembly drawing reference designations of the replaceable parts.

Table 6-1. Replaceable Parts List (Page 1 of 15)

| REFERENCE DESIGNATION | PART OR IDENT. # | MAN. CODE | DESCRIPTION |
|---|---|---|---|
| | RMU Mainframe (G1-G3 Versions), LM-111200-G[] | | |
| A4 | 111209-G1 | 23207 | AUDIO CABLE ASSY |
| A5 | 111346-G1 | 23207 | INTERFACE CABLE ASSY |
| L1, L2 | 104619 | 23207 | FERRITE BEAD |
| F1 | 103282-G9 | 23207 | FUSE, SLOW-BLOW 3/16A, 250V |
| | 107522-G1 | 23207 | FUSE HOLDER |
| | 107523-G1 | 23207 | FUSE CARRIER |
| J1 | 104907 | 23207 | AC CONNECTOR |
| | 104943 | 23207 | AC POWER CORD |
| S1 | 104862 | 23207 | 3 PDT ROCKER SWITCH |
| S2 | 104804 | 23207 | DPDT SLIDE SWITCH |
| T1 | 104660 | 23207 | TRANSFORMER |
| TB1 | 103253-G9 | 23207 | BARRIER BLOCK, RT ANGLE |

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Table 6-1. Replaceable Parts List (Page 2 of 15)

| REFERENCE DESIGNATION | PART OR IDENT. # | MAN. CODE | DESCRIPTION |
|---|---|---|---|
| | Analog Board (G1-G3 Versions), LM-111216-G[] | | |
| Used at U20, U21 | 7403-09FR-54 | BERGQUIST | "SIL PAD" INSULATOR |
| BT1,BT2,BT3 | 110784 | 23207 | BATTERY, Ni-CAD, 1.2V, 0.5AH/0.6AH |
| C1A,C1B,C1C, C4A,C4B,C4C, C6A,C6B,C6C, C7A,C7B,C7C, C12A,C12B,C12C, C13A,C13B,C13C, C15A,C15B,C15C, C16A,C16B,C16C, C23A,C23B,C23C, C24A,C24B,C24C, C33,C35,C36,C38, C43,C48,C49,C50, C51,C54,C56,C60, C61,C66,C67,C68 | 103209-G3 | 23207 | CAP FXD CER, 0.47uF ±20%, 50V |
| C2A,C2B,C2C, C9A,C9B,C9C, C39 | 104087-G3 | 23207 | CAP FXD FLM, 0.022uF ±10%, 63V |
| C3A,C3B,C3C, C32 | 104015-G2 | 23207 | CAP FXD MICA, 220pF ±5%, 500V |
| C5A,C5B,C5C | 104067-G8 | 23207 | CAP FXD TANT, 2.2uF ±10%, 25V |
| C8A,C8B,C8C, C19A,C19B, C19C,C20A, C20B,C20C,C40, C41 | 104087-G1 | 23207 | CAP FXD FLM, 0.01uF ±10%, 63V |
| C11A,C11B, C11C,C34 | 104022-G3 | 23207 | CAP FXD MICA, 56pF ±5%, 500V |
| C14A,C14B, C14C,C37 | 104018-G5 | 23207 | CAP FXD MICA, 150pF ±5%, 500V |

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Table 6-1. Replaceable Parts List (Page 3 of 15)

| REFERENCE DESIGNATION | PART OR IDENT. # | MAN. CODE | DESCRIPTION |
|---|---|---|---|
| C17A,C17B, C17C | 104088-G1 | 23207 | CAP FXD FLM, 1500pF ±10%, 100V |
| C18A,C18B, C18C | 104087-G2 | 23207 | CAP FXD FLM, 0.015uF ±10%, 63V |
| C21A,C21B, C21C,C26A, C26B,C26C, C27A,C27B, C27C | 104022-G4 | 23207 | CAP FXD MICA, 200pF ±5%, 500V |
| C22A,C22B, C22C,C45,C52 | 104109-G3 | 23207 | CAP VAR CER, 6.5pF to 30.0pF, 100V |
| C25A,C25B, C25C | 104022-G5 | 23207 | CAP FXD MICA, 180pF ±5%, 500V |
| C28A,C28B, C28C,C29A, C29B,C29C | 104089 | 23207 | MATCHED PAIR CAP 0.022uF, 63V |
| C30A,C30B, C30C,C31A, C31B,C31C, C46 | 104023-G1 | 23207 | CAP FXD MICA, 100pF ±1%, 500V |
| C42,C44 | 104023-G8 | 23207 | CAP FXD MICA, 300pF ±2%, 500V |
| C42 | 104090 | 23207 | MATCHED PAIR 1000pF NOM, MATCHED TO ½% |
| C46,C47 | 104091 | 23207 | MATCHED PAIR 43pF NOM, MATCHED TO ½% |
| C47 | 104111-G3 | 23207 | CAP FXD MICA, 75pF ±2%, 500V |
| C53 | 104016-G1 | 23207 | CAP FXD MICA, 15pF ±5%, 500V |
| C55 | 103209-G2 | 23207 | CAP FXD CER, 0.22uF ±20%, 50V |

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Table 6-1. Replaceable Parts List (Page 4 of 15)

| REFERENCE DESIGNATION | PART OR IDENT. # | MAN. CODE | DESCRIPTION |
|---|---|---|---|
| C57,C58,C59 | 104080-G1 | 23207 | CAP FXD ELEC, 47uF ±20%, 50V |
| C62,C69 | 104021-G6 | 23207 | CAP FXD MICA, 1000pF ±2%, 100V |
| C63,C64 | 104082-G2 | 23207 | CAP FXD ELEC, 1000uF -10%/+50%, 50V |
| C65 | 104082-G3 | 23207 | CAP FXD ELEC, 4700uF -10%/+50%, 25V |
| C70 | 104111-G5 | 23207 | CAP FXD MICA, 43pF ±2%, 500V |
| C71-C74 | 104095-G1 | 23207 | CAP FXD FLM, 0.01uF ±20%, 125 V ac |
| CR1A,CR1B, CR1C,CR2A, CR2B,CR2C, CR3A,CR3B,CR3C, CR4A,CR4B,CR4C, CR5A,CR5B,CR5C, CR6A,CR6B,CR6C, CR7,CR8,CR9,CR10, CR11,CR27,CR30 | 104412-G2 | 23207 | DIODE, HI-SPEED SWITCHING |
| CR12,CR13 | 102899 | 23207 | DIODE, SHOTTKY BARRIER |
| CR14,CR15, CR28,CR29 | 101345 | 23207 | DIODE, LOW LEAKAGE |
| CR16-CR26 | 104405-G1 | 23207 | DIODE, GEN PURP RECT SILICON |
| J1 | 87348-3 | 00779 | POST HEADER, 3 POS |
| Used at J1 | 2-530153-2 | 00779 | SHUNT, 2 POS |
| L1,L2 | 104636-G1 | 23207 | INDUCTOR, 1.0mh |
| P1,P2 | 2-86945-9 | 00779 | FLAT FLEX CABLE ASSY |

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Table 6-1. Replaceable Parts List (Page 5 of 15)

| REFERENCE DESIGNATION | PART OR IDENT. # | MAN. CODE | DESCRIPTION |
|---|---|---|---|
| Q1A,Q1B,Q1C, Q2A,Q2B,Q2C, Q3,Q4 | 104515 | 23207 | TRANSISTOR, NPN SILICON |
| R1A,R1B,R1C | RCR07G822J | 23207 | RES FXD COMP 8.2K ±5%, ¼W |
| R2A,R2B,R2C, R6A,R6B,R6C, R30 | RCR07G107J | 23207 | RES FXD COMP 100M ±5%, ¼W |
| R3A,R3B,R3C | RCR07G561J | 23207 | RES FXD COMP 560-Ohms ±5%, ¼W |
| R4A,R4B,R4C, R29,R61 | RCR07G333J | 23207 | RES FXD COMP 33K ±5%, ¼W |
| R5A,R5B,R5C, | 104700-G3 | 23207 | RES VAR 1K ±10%, ½W |
| R7A,R7B,R7C | RN55C1001F | 23207 | RES FXD FLM, 1.00K ±1%, 1/10W |
| R8A,R8B,R8C | RN55C4021F | 23207 | RES FXD FLM, 4.02K ±1%, 1/10W |
| R9A,R9B,R9C, R31 | RCR07G431J | 23207 | RES FXD COMP, 430-Ohms ±5%, ¼W |
| R10A,R10B, R10C,R14A, R14B,R14C,R32, R37 | RN55C4321F | 23207 | RES FXD FLM, 4.32K ±1%, 1/10W |
| R11A,R11B, R11C,R33, R66 | RN55C2211F | 23207 | RES FXD FLM, 2.21K ±1%, 1/10W |
| R12A,R12B, R12C | RN55C2322F | 23207 | RES FXD FLM, 23.2K ±1%, 1/10W |
| R13A,R13B, R13C | RN55C1243F | 23207 | RES FXD FLM, 124K ±1%, 1/10W |
| R15A,R15B, R15C,R35, R63,R64,R71 | 104719-G8 | 23207 | RES VAR 2K ±10%, ½W |

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Table 6-1. Replaceable Parts List (Page 6 of 15)

| REFERENCE DESIGNATION | PART OR IDENT. # | MAN. CODE | DESCRIPTION |
|---|---|---|---|
| R16A,R16B, R16C,R36 | RN55C9091F | 23207 | RES FXD FLM, 9.09K ±1%, 1/10W |
| R17A,R17B, R17C,R39 | RN55C2002F | 23207 | RES FXD FLM, 20K ±1%, 1/10W |
| R18A,R18B, R18C | RN55C8872F | 23207 | RES FXD FLM, 88.7K ±1%, 1/10W |
| R19A,R19B, R19C,R40 | RN55C1213F | 23207 | RES FXD FLM, 121K ±1%, 1/10W |
| R20A,R20B, R20C | RN55C3163F | 23207 | RES FXD FLM, 316K ±1%, 1/10W |
| R21A,R21B, R21C,R22A, R22B,R22C | RCR07G395J | 23207 | RES FXD COMP, 3.9M ±5%, ¼W |
| R23A,R23B, R23C | 104719-G4 | 23207 | RES VAR, 20K ±10%, ½W |
| R24A,R24B, R24C,R69,R70 | RN55C1002F | 23207 | RES FXD FLM, 10.0K ±1%, 1/10W |
| R34 | 104701-G3 | 23207 | RES VAR 200K ±10%, ½W |
| R38 | RN55C9092F | 23207 | RES FXD FLM, 90.9K ±1%, 1/10W |
| R41,R42 | RN55D3324F | 23207 | RES FXD FLM, 3.32M ±1%, 1/10W |
| R41 | RN55C4323F | 23207 | RES FXD FLM, 432K ±1%, 1/10W |
| R43,R44 | RN55D1005F | 23207 | RES FXD FLM, 10M ±1%, 1/10W |
| R45,R47,R49, R51,R53 | RN55D1004F | 23207 | RES FXD FLM, 1.00M ±1%, 1/10W |
| R46,R54-R58 | RN55C1003F | 23207 | RES FXD FLM, 100K ±1%, 1/10W |

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Table 6-1. Replaceable Parts List (Page 7 of 15)

| REFERENCE DESIGNATION | PART OR IDENT. # | MAN. CODE | DESCRIPTION |
|---|---|---|---|
| R48,R60 | RCR07G105J | 23207 | RES FXD COMP, 1M ±5%, ¼W |
| R50 | RCR07G391J | 23207 | RES FXD COMP, 390-Ohms ±5%, ¼W |
| R52 | RCR07G514J | 23207 | RES FXD COMP, 510K ±5%, ¼W |
| R59 | RCR07G226J | 23207 | RES FXD COMP, 22M ±5%, ¼W |
| R62,R65 | RCR07G121J | 23207 | RES FXD COMP, 120-Ohms ±5%, ¼W |
| R67,R76,R77 | RCR07G331J | 23207 | RES FXD COMP, 330-Ohms ±5%, ¼W |
| R72 | RN55C4641F | 23207 | RES FXD FLM, 4.64K ±1%, 1/10W |
| R73 | RN55C3323F | 23207 | RES FXD FLM, 332K ±1%, 1/10W |
| R74 | 104719-G7 | 23207 | RES VAR 100K ±10%, ½W |
| R75 | RN55D8874F | 23207 | RES FXD FLM, 8.87M ±1%, 1/10W |
| RN1A,RN1B, RN1C,RN2A, RN2B,RN2C | 104731 | 23207 | RESISTOR NETWORK |
| U1A,U1B,U1C, U7A,U7B,U7C | 104228 | 23207 | IC, DUAL OP AMP LOW POWER |
| U2AB,U2CD, U4AB,U4DC, U5,U6AB,U6CD, U8,U9AB,U9CD, U10-U13 | 104236-G1 | 23207 | IC, DUAL OP AMP |
| U3 | 104264-G1 | 23207 | IC, OP AMP LOW POWER |

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Table 6-1. Replaceable Parts List (Page 8 of 15)

| REFERENCE DESIGNATION | PART OR IDENT. # | MAN. CODE | DESCRIPTION |
|---|---|---|---|
| U14 | 104273-G1 | 23207 | IC, CMOS TIME CLK PLUS MEMORY |
| U15,U16 | 104270-G1 | 23207 | IC, CMOS 2K-BYTE RAM, LOW POWER |
| U17 | 104225-G7 | 23207 | IC, CMOS OCTAL LATCH, TRI-STATE |
| U18 | 104280-G1 | 23207 | IC, QUAD CMOS OP AMP/ COMPARATOR |
| U19 | 104225-G5 | 23207 | IC, OCTAL TRI-STATE DRIVER |
| U20 | 104531-G4 | 23207 | IC, ADJ NEG REGULATOR |
| U21 | 104531-G3 | 23207 | IC, ADJ POS REGULATOR |
| U22 | 104219-G3 | 23207 | IC, +5V REGULATOR |
| Used at U14, U15,U16 | 104933 | 23207 | IC SOCKET, 24-PIN |
| Y1 | 107546-G1 | 23207 | CRYSTAL 32.768 kHz |
| | Digital Board (G1-G3 Versions), LM-111210-G[] | | |
| C1-C14, C16-C22, C41-C44, C45A-D,C46A-D | 103209-G3 | 23207 | CAP FXD CER, 0.47uF ±20%, 50V |
| C25 | 104067-G3 | 23207 | CAP FXD TANT, 56uF ±10%, 6V |
| C26,C27,C50 | 104067-G7 | 23207 | CAP FXD TANT, 33uF ±10%, 16V |
| C28-C33 | 104021-G6 | 23207 | CAP FXD MICA, 1000pF ±2%, 100V |

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| REFERENCE DESIGNATION | PART OR IDENT. # | MAN. CODE | DESCRIPTION |
|---|---|---|---|
| C34,C35 | 104026-G5 | 23207 | CAP FXD MICA, 20pF ±5%, 500V |
| C36,C37 | 104015-G2 | 23207 | CAP FXD MICA, 220pF ±5%, 500V |
| C38,C39 | 104022-G4 | 23207 | CAP FXD MICA, 200pF ±5%, 500V |
| C40 | 104022-G3 | 23207 | CAP FXD MICA, 56pF ±5%, 500V |
| C47A-D | 104087-G3 | 23207 | CAP FXD FLM, 0.022uF ±10%, 0.63V |
| CR2-CR5, CR6A-C,CR7A-D, CR8A-D,CR9A-C | 104412-G2 | 23207 | DIODE, HI-SPEED SWITCHING |
| CR10,CR11 | 102899 | 23207 | DIODE SHOTTKY BARRIER |
| Used at JA | 2-530153-2 | 00779 | SHUNT, 2 POS |
| JA | 87348-3 | 00779 | POST HEADER, 3 POS |
| Used at J1, J2,J3 | 643115-1 | 00779 | DIP SOCKET STRIP, 15 POS |
| J4 | 87348-4 | 00779 | POST HEADER, 6 POS |
| J5 | 745641-1 | 00779 | CASSETTE HOLDER |
| Q3A-D | 104515 | 00779 | TRANSISTOR, LN AUDIO |
| R1-R4,R35D | RN55C1001F | 23207 | RES FXD FLM, 1.00K ±1%, 1/10W |
| R5 | RN55D1004F | 23207 | RES FXD FLM, 1.00M ±1%, 1/10W |
| R7 | RCR07G106J | 23207 | RES FXD COMP, 10M ±5%, ¼W |

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Table 6-1. Replaceable Parts List (Page 10 of 15)

| REFERENCE DESIGNATION | PART OR IDENT. # | MAN. CODE | DESCRIPTION |
|---|---|---|---|
| R8-R11,R23 | RCR07G104J | 23207 | RES FXD COMP, 100K ±5%, ¼W |
| R12 | RN55C5112F | 23207 | RES FXD FLM, 51.1K ±1%, 1/10W |
| R13,R14,R16 | RN55C1003F | 23207 | RES FXD FLM, 100K ±1%, 1/10W |
| R15 | RN55C5113F | 23207 | RES FXD FLM, 511K ±1%, 1/10W |
| R17 | RN55D2214F | 23207 | RES FXD FLM, 2.21M ±1%, 1/10W |
| R18,R19 | RCR07G510J | 23207 | RES FXD COMP, 51-Ohms ±5%, ¼W |
| R20-R22, R30A-C | RN55C1002F | 23207 | RES FXD FLM, 10K ±1%, 1/10W |
| R24-R26, R33A-D | 104719-G10 | 23207 | RES VAR 200K ±10%, ½W |
| R27A-C | RN55C1302F | 23207 | RES FXD FLM, 13.0K ±1%, 1/10W |
| R28A-C, R29A-C | RN55C1003C | 23207 | RES FXD FLM, 100K ±0.25%, 1/10W |
| R30D | RN55C4021F | 23207 | RES FXD FLM, 4.02K ±1%, 1/10W |
| R31A-C | RN55C2002F | 23207 | RES FXD FLM, 20.0K ±1%, 1/10W |
| R31D | RCR07G561J | 23207 | RES FXD COMP, 560-Ohms ±5%, ¼W |
| R32A-D | RCR07G107J | 23207 | RES FXD COMP, 100M ±5%, ¼W |
| R34A-D | RCR07G822J | 23207 | RES FXD COMP, 8.2K ±5%, ¼W |

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Table 6-1. Replaceable Parts List (Page 11 of 15)

| REFERENCE DESIGNATION | PART OR IDENT. # | MAN. CODE | DESCRIPTION |
|---|---|---|---|
| R36D | 104719-G6 | 23207 | RES VAR, 1K ±10%, ½W |
| R37 | 104719-G5 | 23207 | RES VAR, 50K ±10%, ½W |
| RN1 | 104733-G5 | 23207 | RES NETWORK, 1M, SIP |
| U1 | 104239-G1 | 23207 | IC CMOS MICROPROCESSOR |
| U2,U3 | SEE PROGRAM LISTING 105912 | 23207 | IC CMOS EPROM 4K-BYTE |
| U4 | 104365 | 23207 | IC, 10-BIT A/D CONVERTER |
| U5 | 104217-G3 | 23207 | IC, CMOS 8-INPUT PRIORITY ENCODER |
| U6 | 104225-G7 | 23207 | IC, CMOS OCTAL TRANS LATCH TRI-STATE |
| U7,U8,U33 | 104225-G6 | 23207 | IC, CMOS OCTAL D LATCH TRI-STATE |
| U9 | 104221-G7 | 23207 | IC, DUAL 1 OF 4 DECODER |
| U10,U11 | 104271-G3 | 23207 | IC, CMOS 1 OF 8 DECODER |
| U12-U14 | 104392-G1 | 23207 | IC, CMOS QUAD 2 INPUT NAND |
| U15 | 104392-G2 | 23207 | IC, CMOS DUAL D FLIP-FLOP |
| U16 | 104231-G5 | 23207 | IC, CMOS DUAL ONE-SHOT |
| U17 | 104241-G2 | 23207 | IC, QUAD COMPARATOR |
| U18-U20 | 104362 | 23207 | IC, CMOS QUAD ANALOG SWITCH |
| U21,U32A-D | 104251-G1 | 23207 | IC, OP AMP |
| U22,U29,U30 | 104264-G1 | 23207 | IC, OP AMP LOW POWER |

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Table 6-1. Replaceable Parts List (Page 12 of 15)

| REFERENCE DESIGNATION | PART OR IDENT. # | MAN. CODE | DESCRIPTION |
|---|---|---|---|
| U23 | 104225-G5 | 23207 | IC, CMOS OCTAL BUFFER TRI-STATE |
| U24 | 104389-G2 | 23207 | IC, ACIA COMM INTERFACE |
| U25 | 104222-G1 | 23207 | IC, LINE DRIVER RS-232 |
| U26 | 104222-G2 | 23207 | IC, LINE RECEIVER RS-232 |
| U27 | 104271-G5 | 23207 | IC, QUAD 2 INPUT NOR |
| U31A-D | 104236-G1 | 23207 | IC, DUAL OP AMP LOW POWER |
| Y1 | 110729-G3 | 23207 | CRYSTAL 5.000 MHz |
| Y2 | 107540 | 23207 | CRYSTAL 1.8432 MHz |
| Used at U4 | 104930 | 23207 | IC SOCKET, 18-PIN |
| Used at U2 and U3 | 104933 | 23207 | IC SOCKET, 24-PIN |
| Used at U24 | 104934 | 23207 | IC SOCKET, 28-PIN |
| Used at U1 | 104935 | 23207 | IC SOCKET, 40-PIN |
| | LED Indicator Board (G1-G3 Versions), LM-111222-G[] | | |
| C1,C2 | 103209-G3 | 23207 | CAP FXD CER, 0.47uF ±20%, 50V |
| C3 | 104067-G3 | 23207 | CAP FXD TANT, 56uF ±20%, 6V |
| | 10241 | MILTON ROSS | TRANSI-PAD |
| DS1,DS4,DS7, DS10,DS13 | 104434-G1 | 23207 | LED (RED) |
| DS2,DS5,DS8, DS11,DS14 | 104434-G2 | 23207 | LED (YELLOW) |
| DS3,DS6,DS9, DS12,DS15,DS16 | 104434-G3 | 23207 | LED (GREEN) |

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Table 6-1. Replaceable Parts List (Page 13 of 15)

| REFERENCE DESIGNATION | PART OR IDENT. # | MAN. CODE | DESCRIPTION |
|---|---|---|---|
| R1,R4,R7, R10,R13 | RCR07G331J | 23207 | RES FXD COMP, 330-Ohms ±5%, ¼W |
| R2,R3,R5,R6 R8,R9,R11,R12, R14,R15,R16 | RCR07G151J | 23207 | RES FXD COMP, 150-Ohms ±5%, ¼W |
| U1,U2 | 104395-G1 | 23207 | IC, OCTAL D-TYPE F/F |
| P1 | 1-86945-4 | 00779 | FLEX CABLE |
| | RMU Adapter Board (G1-G3 Versions), LM-111244-G[] | | |
| C1-C4,C6, C8-C13,C21 | 103209-G3 | 23207 | CAP FXD CER, 0.47uF ±20%, 50V |
| C14 | 104067-G3 | 23207 | CAP FXD TANT, 56uF ±20%, 6V |
| C15-C18 | 104022-G4 | 23207 | CAP FXD MICA, 200pF ±5%, 500V |
| C19,C20 | 104015-G2 | 23207 | CAP FXD MICA, 220pF ±5%, 500V |
| J3A | TSW-116-10-G-S | SAMTEC | HEADER, 16 POS, 0.1" CENT, 0.6" HIGH |
| R1 | RCR07G103J | 23207 | RES FXD COMP, 10K ±5%, ¼W |
| R2,R3 | RCR07G510J | 23207 | RES FXD COMP, 51-Ohms ±5%, ¼W |
| R4 | RCR07G104J | 23207 | RES FXD COMP, 100K ±5%, ¼W |
| R5 | RCR07G681J | 23207 | RES FXD COMP, 680K ±5%, ¼W |

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Table 6-1. Replaceable Parts List (Page 14 of 15)

| REFERENCE DESIGNATION | PART OR IDENT. # | MAN. CODE | DESCRIPTION |
|---|---|---|---|
| U2 | 104392-G1 | 23207 | IC, CMOS QUAD 2-IP NAND |
| U3 | SEE PROGRAM LIST 105909 | 23207 | IC, CMOS 4K-BYTE UV EPROM |
| U5 | 104390 | 23207 | IC, CMOS OCTAL TRANSCEIV |
| U7,U8 | 104271-G4 | 23207 | IC, CMOS DUAL QUAD DECODER |
| U9 | 104389-G2 | 23207 | IC, ACIA COMM INTERFACE |
| U10 | 104225-G5 | 23207 | IC, CMOS OCTAL TRI-STATE BUFFER |
| U11 | 104222-G1 | 23207 | IC, LINE DRIVER |
| U12 | 104222-G2 | 23207 | IC, LINE RECEIVER |
| U13 | 104271-G5 | 23207 | IC, CMOS QUAD NOR |
| U14 | 104392-G3 | 23207 | IC, CMOS QUAD OR |
| U15 | 104392-G4 | 23207 | IC, CMOS OCTAL D LATCH, TRI-STATE |
| Y1 | 107540 | 23207 | CRYSTAL, 1.8432 MHz |
| Used at U3 | 104933 | 23207 | IC SOCKET, 24-PIN |
| Used at U9 | 104934 | 23207 | IC SOCKET, 28-PIN |
| | 626-PA-6036 Mainframe (G1-G3 Versions), LM-111243-G[] | | |
| A1 | LM111244 -G1,-G2 | 23207 | PRTD CKT BD ASSY, RMU ADAPTER |
| A2 | LM111236-G9 | 23207 | MODEM BOARD |
| A3 | LM110541 | 23207 | PHONE JACK BOARD |
| | LM111349-G1 | 23207 | PHONE CORD ASSY |
| | LM111347 | 23207 | COMM INTERFACE CABLE |
| | 110709 | 23207 | PHONE LINE CORD, 25-ft |

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Table 6-1. Replaceable Parts List (Page 15 of 15)

| REFERENCE DESIGNATION | PART OR IDENT. # | MAN. CODE | DESCRIPTION |
|---|---|---|---|
| | 205817-1 | 00779 | FEMALE SCREWLOCK ASSY |
| | 106670 | 23207 | INPUT MOUNTING BRACKET |
| | 8218A0440-17 | 06540 | STANDOFF, ¼HEX x 3/4" LG |
| | 8215A0440-17 | 06540 | STANDOFF, ¼HEX x ½" LG |
| | 8217-A-0440-17 | 06540 | STANDOFF, ¼HEX x 5/8" LG |
| | 2501 | H.H. SMITH | SCREW, #4 x 3/8" LG, NYLON |
| | 2671 | H.H. SMITH | WASHER, NYLON |

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### 6.1.2 Manufacturer's Reference Codes

The referenced manufacturer's codes from table 6-1 are listed below:

| MAN. CODE | ADDRESS |
|---|---|
| 23207 | Dranetz Technologies, Inc.<br>1000 New Durham Rd., PO Box 4019<br>Edison, New Jersey 08818-4019<br>(201) 287-3680 |
| 06540 | Amatom Electronic Hardware Co.<br>446 Blake Street<br>New Haven, CT 06515<br>(203) 397-3311 |
| 00779 | Amp Inc., PO Box 3608<br>Harrisburg, PA 17105<br>(717) 564-0100 |
| BERGQUIST | Bergquist Co.<br>5300 Edina Industrial Blvd.<br>Minneapolis, MN 55435<br>(612) 835-2322 |
| H.H. SMITH | H.H. Smith Inc.<br>1913 Atlantic Avenue<br>Manasquan, NJ 08736<br>(201) 223-9400 |
| MILTON ROSS | Milton Ross Co.<br>1770 Walt Whitman Rd.<br>Melville, NY 11747<br>(516) 420-0200 |
| SAMTEC | Samtec Inc.<br>810 Progress Blvd.<br>PO Box 1147<br>New Albany, IN 47150<br>(812) 944-6733 |

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# SECTION VII
# SCHEMATICS AND GENERAL ASSEMBLY

## 7.1 GENERAL

This section of the manual contains the schematics and assembly drawings for the RMU and the 626-PA-6036 Interface Adapter. The revision levels of the schematics and drawings are indicated on their respective pages.

## 7.2 ASSEMBLY DRAWINGS AND WIRING DIAGRAM

Illustrated on fold-out pages 7-3 through 7-21 are the following assembly drawings and wiring diagram:

Fig 7-1. Remote Monitor Main Assembly: 111200-G[]

Fig 7-2. Analog Board Assembly: 111216-G[]

Fig 7-3. Digital Board Assembly: 111210-G[]

Fig 7-4. LED Indicator Board Assembly: 111222-G[]

Fig 7-5. RMU Adapter Board (626-PA-6036 PC Bd) Assembly: 111244-G[]

Fig 7-6. 626-PA-6036 W/Option 101 Mainframe Assembly: 111243-G[]

Fig 7-7. 626-RMU Interconnecting Wiring Diagram: 111202-G[]

## 7.3 SCHEMATIC DIAGRAMS

Illustrated on fold-out pages 7-23 through 7-29 are the following schematic diagrams:

Fig 7-8. Analog Board Schematic: Assy 111216-G[], Schem 111221-G[]

Fig 7-9. Digital Board Schematic: Assy 111210-G[], Schem 111215-G[]

Fig 7-10. LED Indicator Board Schematic: Assy 111222-G[], Schem 111227-G[]

Fig 7-11. RMU Adapter Board (626-PA-6036 PC Bd) Schematic: Assy 111244-G[], Schem 111249-G[]

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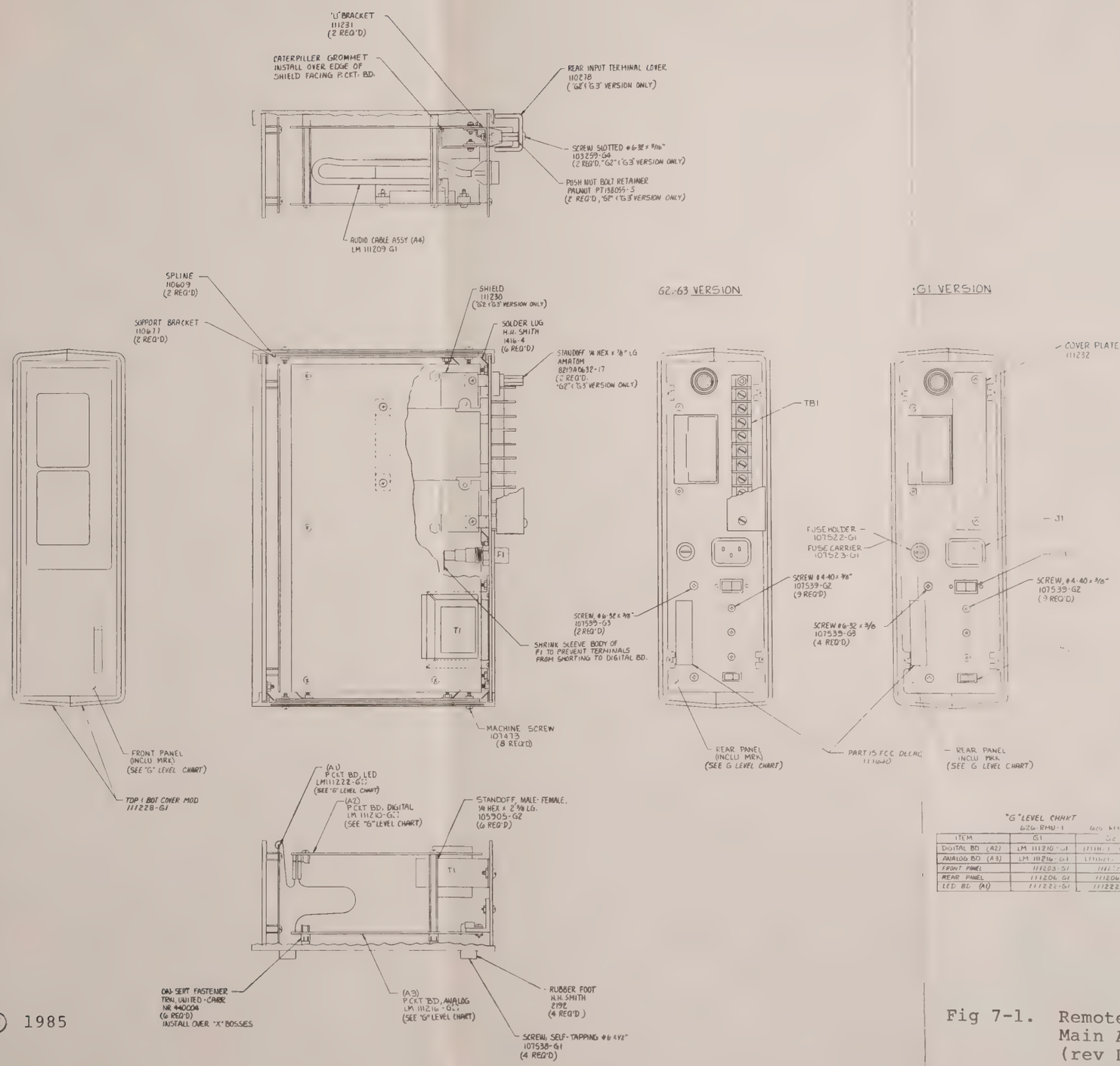


"G" LEVEL CHART

| ITEM | G1 | G2 | G3 |
|---|---|---|---|
| DIGITAL BD (A2) | LM 111210-G1 | LM111210-G2 | LM-111210-G3 |
| ANALOG BD (A3) | LM 111216-G1 | LM111216-G2 | LM111216-G3 |
| FRONT PANEL | 111203-S1 | 111203-S2 | 111203-S3 |
| REAR PANEL | 111206-G1 | 111206-S1 | 111206-G2 |
| LED BD (A1) | 111222-G1 | 111222-G2 | 111222-G3 |

Fig 7-1. Remote Monitor Unit
Main Assy: 111200-G[ ]
(rev D)

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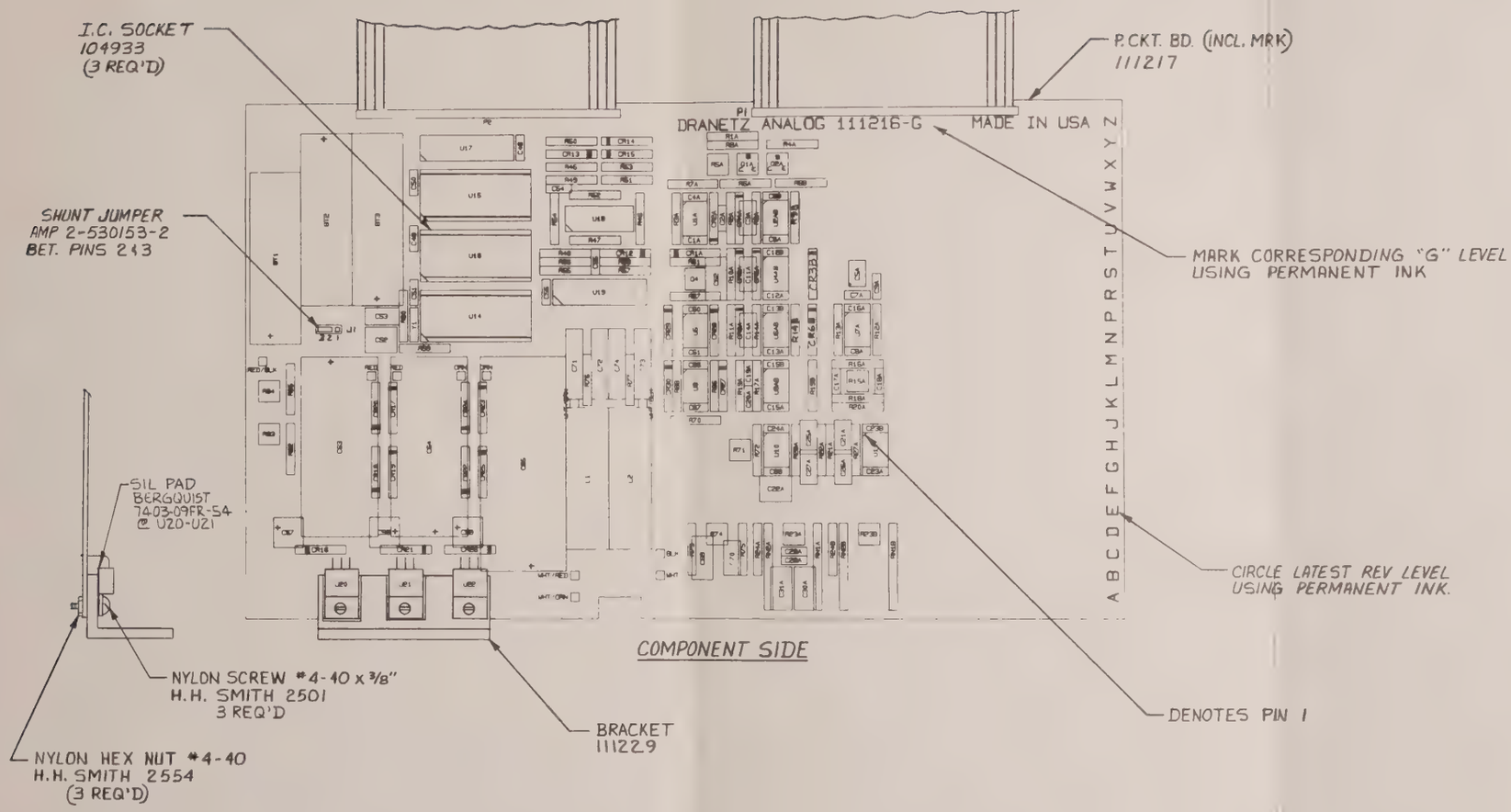


Fig 7-2. Analog Bd Assy: 111216-G1 (rev C) (sheet 1 of 3)

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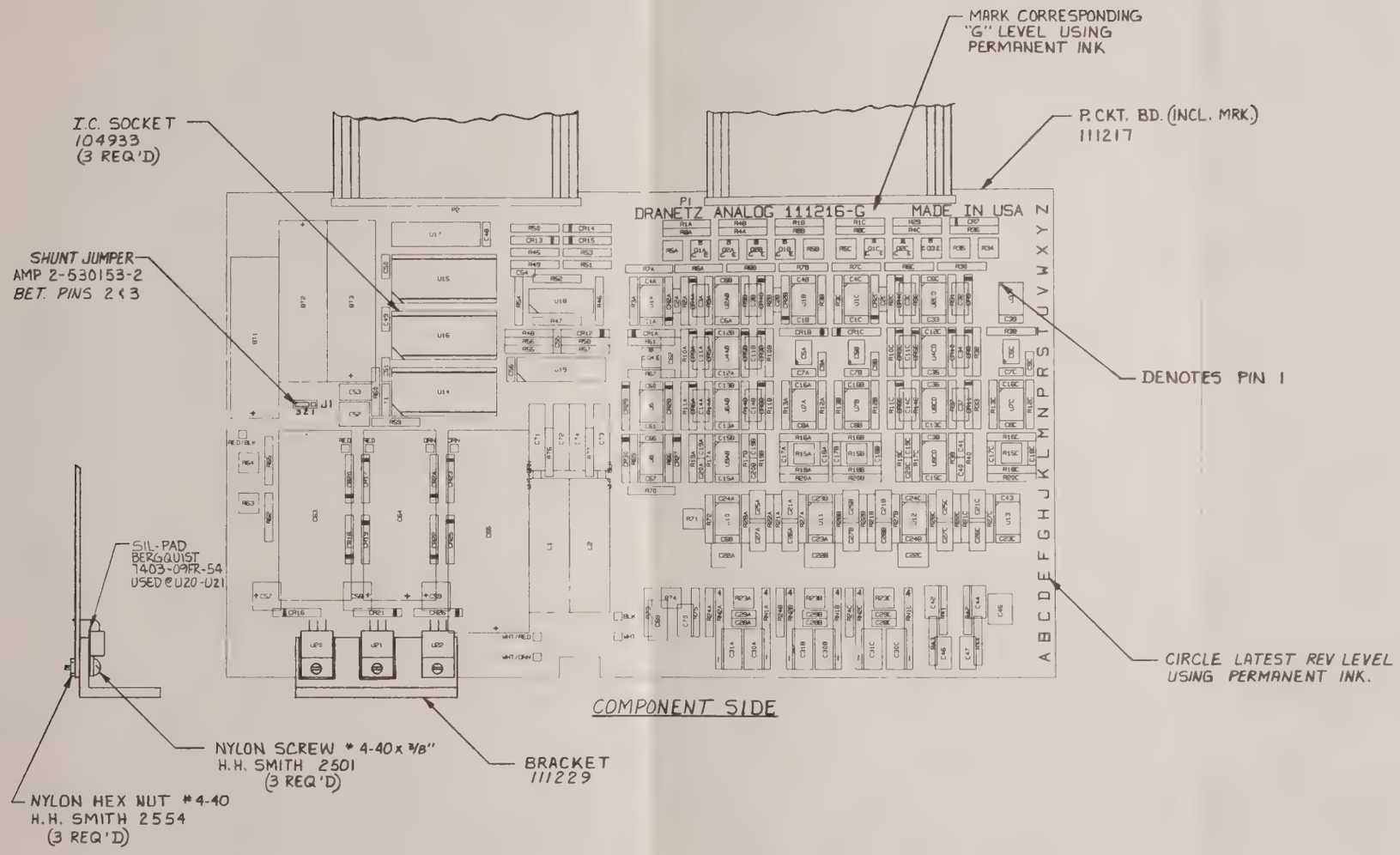
MARK CORRESPONDING "G" LEVEL USING PERMANENT INK
I.C. SOCKET 104933 (3 REQ'D)
P.CKT. BD. (INCL. MRK.) 111217
SHUNT JUMPER AMP 2-530153-2 BET. PINS 2 & 3
P1
DRANETZ ANALOG 111216-G MADE IN USA
DENOTES PIN 1
SIL-PAD BERGQUIST 7403-09FR-54 USED @ U20-U21
CIRCLE LATEST REV LEVEL USING PERMANENT INK.
COMPONENT SIDE
NYLON SCREW * 4-40 x 3/8" H.H. SMITH 2501 (3 REQ'D)
BRACKET 111229
NYLON HEX NUT #4-40 H.H. SMITH 2554 (3 REQ'D)

Fig 7-2. Analog Bd Assy: 111216-G2 (rev C) (sheet 2 of 3)

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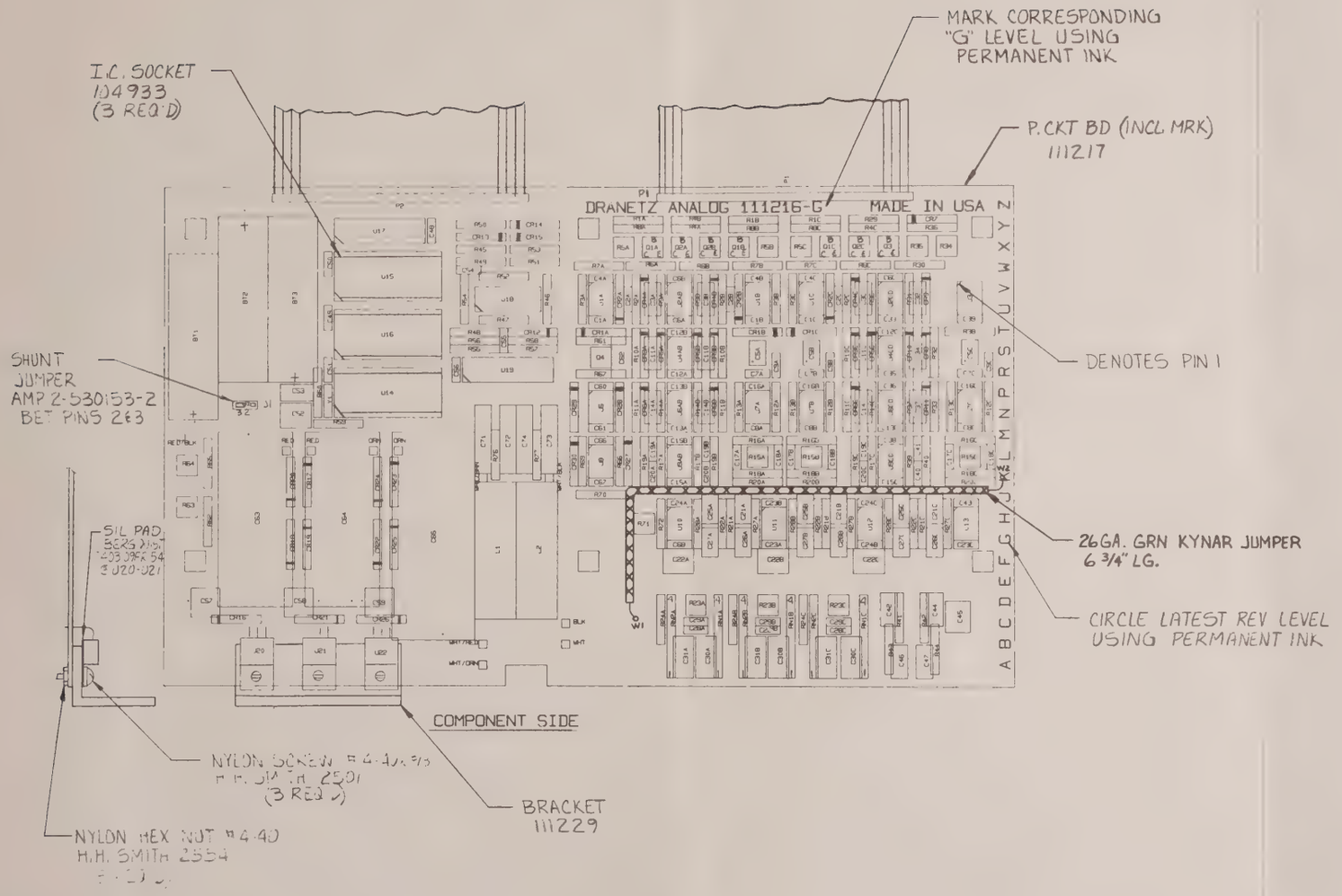


Fig 7-2. Analog Bd Assy:
111216-G3 (rev C)
(sheet 3 of 3)

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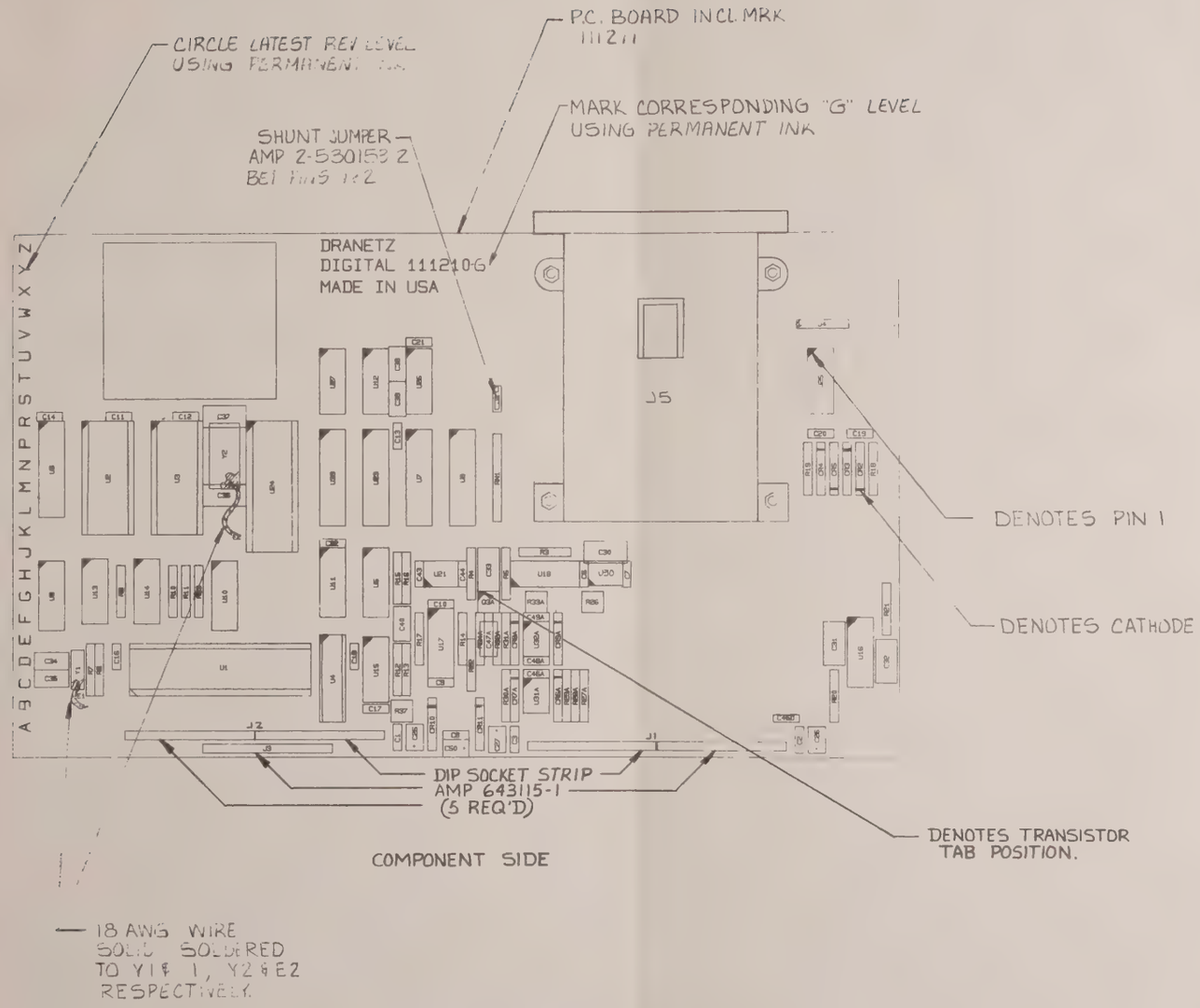


Fig 7-3. Digital Bd Assy: 111210-G1 (rev C) (sheet 1 of 2)

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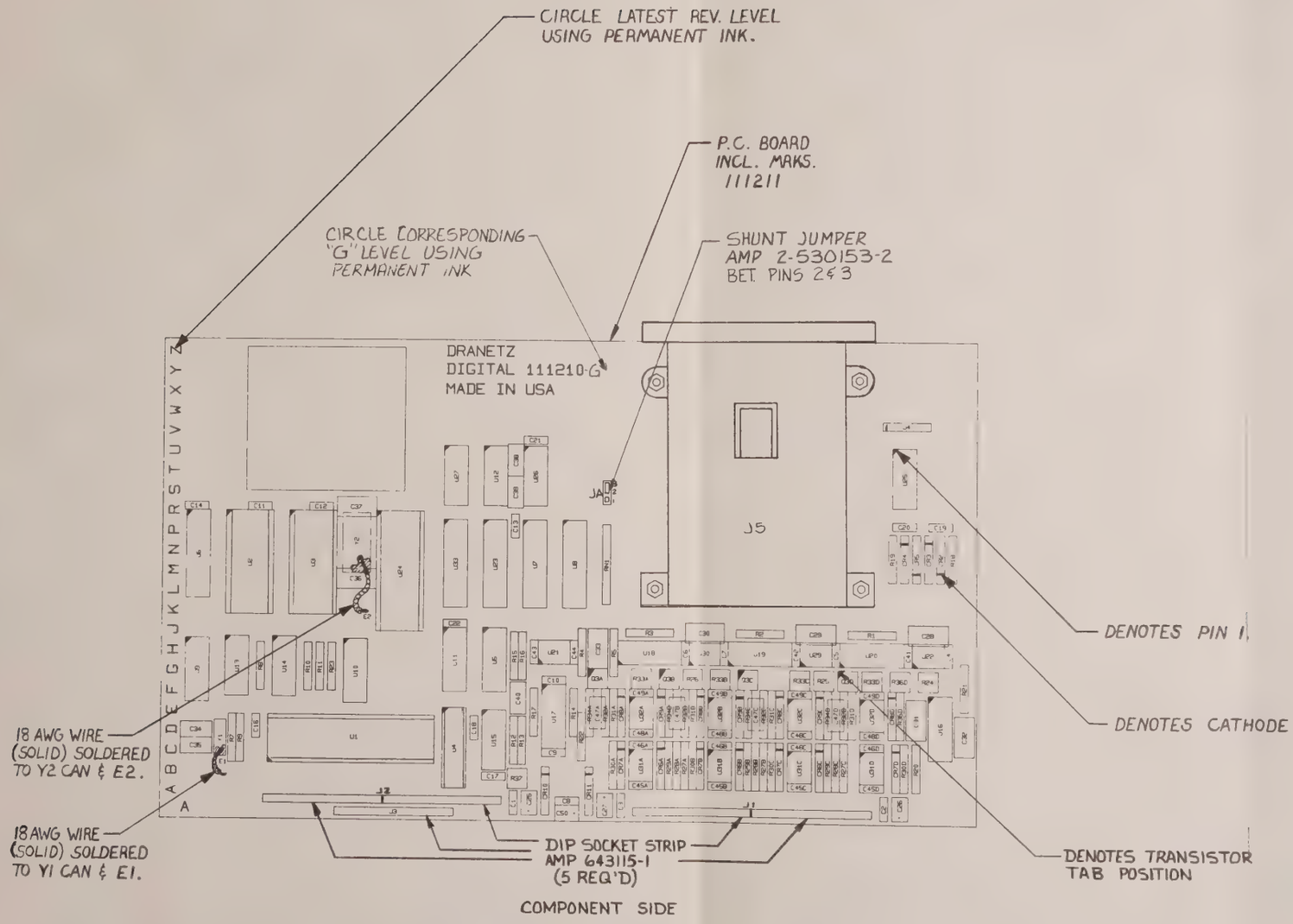
CIRCLE LATEST REV. LEVEL USING PERMANENT INK.
P.C. BOARD INCL. MARKS. 111211
CIRCLE CORRESPONDING "G" LEVEL USING PERMANENT INK
SHUNT JUMPER AMP 2-530153-2 BET. PINS 2 & 3
DRANETZ DIGITAL 111210-G MADE IN USA
A B C D E F G H J K L M N P R S T U V W X Y Z
J5
DENOTES PIN 1.
DENOTES CATHODE
18 AWG WIRE (SOLID) SOLDERED TO Y2 CAN & E2.
18 AWG WIRE (SOLID) SOLDERED TO Y1 CAN & E1.
DIP SOCKET STRIP AMP 643115-1 (5 REQ'D)
DENOTES TRANSISTOR TAB POSITION
COMPONENT SIDE

Fig 7-3. Digital Bd Assy: 111210-G2 (rev C) (sheet 2 of 2)

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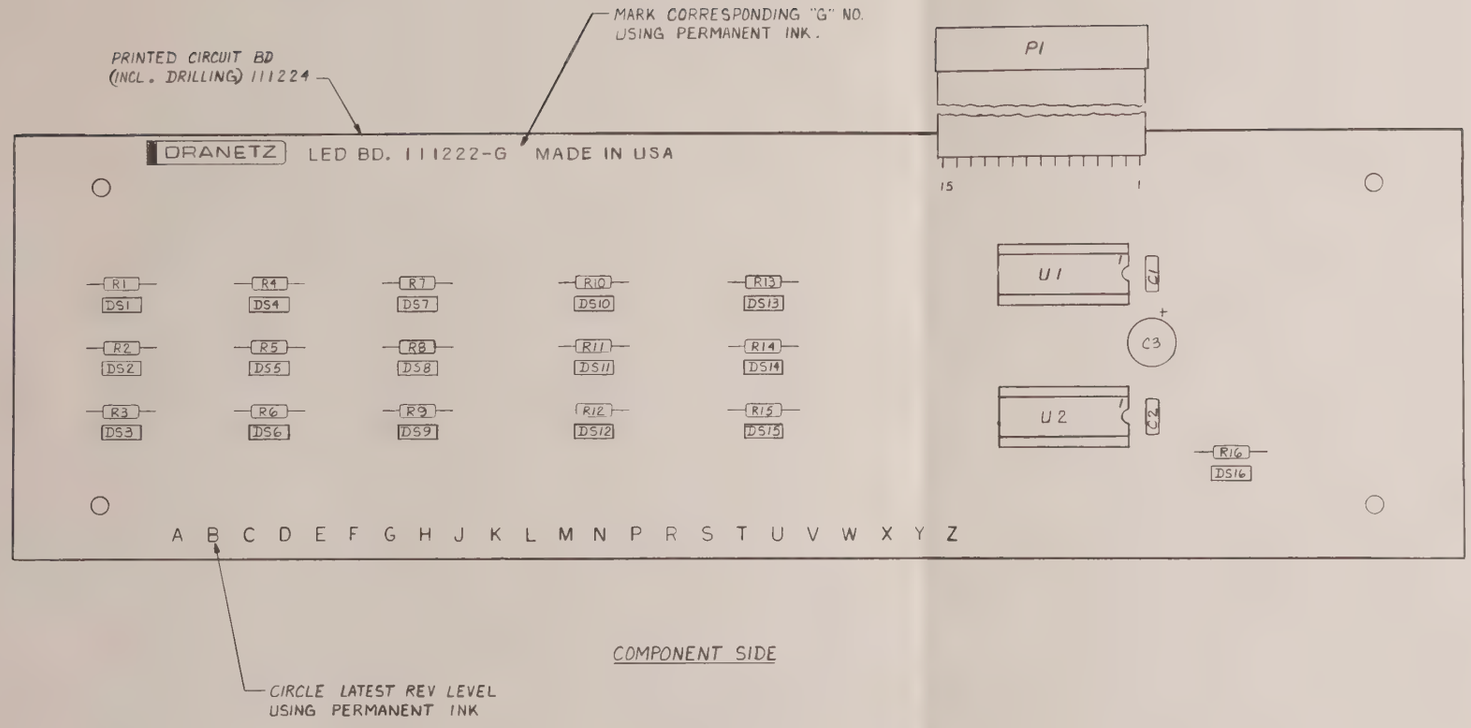


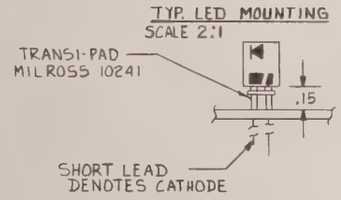


| "G" LEVEL TABLE | |
|---|---|
| "G" NO. | NOT USED |
| -G1 | DS1-6, DS10-12<br>R1-6, R10-R12 |
| -G2 | AS SHOWN |
| -G3 | DS13-15<br>R13-15 |

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Fig 7-4. LED Indicator Bd Assy: 111222-G[] (rev C)

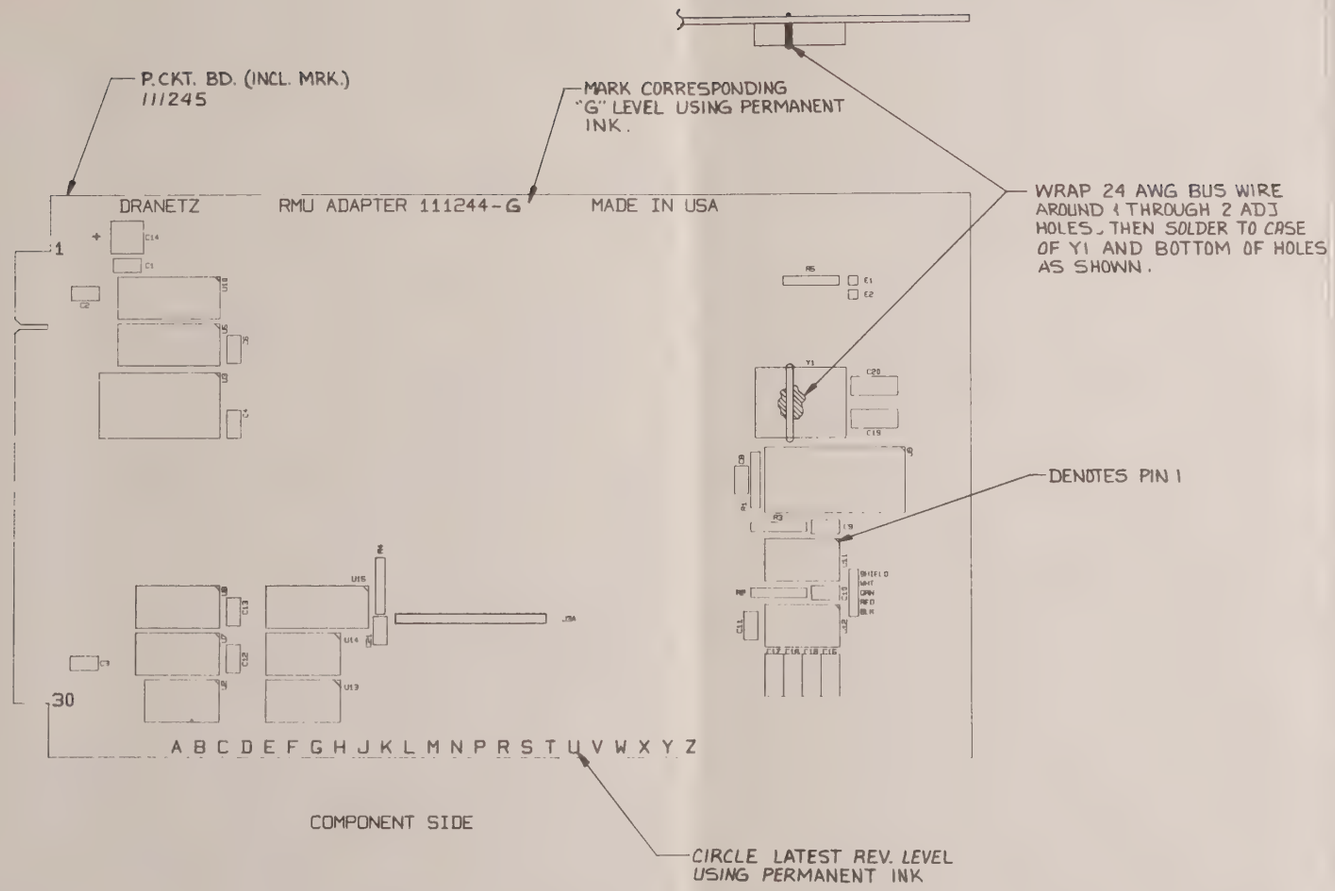
P.CKT. BD. (INCL. MRK.)
111245
MARK CORRESPONDING
"G" LEVEL USING PERMANENT
INK.
WRAP 24 AWG BUS WIRE
AROUND & THROUGH 2 ADJ
HOLES, THEN SOLDER TO CASE
OF Y1 AND BOTTOM OF HOLES
AS SHOWN.
DRANETZ
RMU ADAPTER 111244-G
MADE IN USA
1
30
DENOTES PIN 1
A B C D E F G H J K L M N P R S T U V W X Y Z
COMPONENT SIDE
CIRCLE LATEST REV. LEVEL
USING PERMANENT INK

Fig 7-5. RMU Adapter (626-PA-6036 PC Board) Bd Assy: 111244-G[] (rev D)

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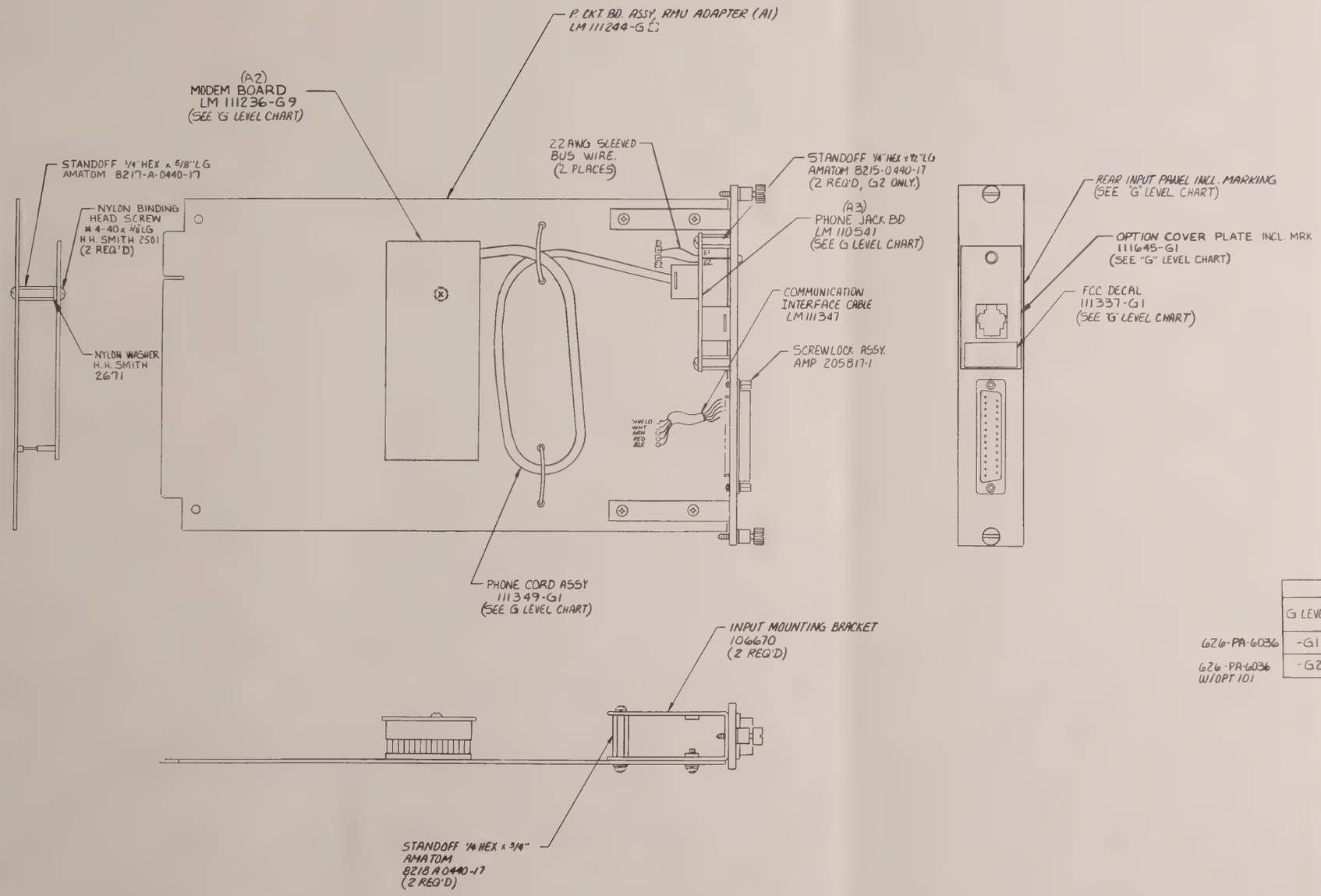


"G" LEVEL CHART

| | G LEVEL | REAR PANEL INCL. MRK | PHONE CORD ASSY. | PHONE JACK BOARD | MODEM BD. | FCC DECAL | OPTION COVER PLATE INCL. MRK |
|---|---|---|---|---|---|---|---|
| 626-PA-6036 | -G1 | 111343-G2 | NOT USED | NOT USED | NOT USED | NOT USED | USED |
| 626-PA-6036 W/OPT 101 | -G2 | 111343-G2 | USED | USED | USED | USED | NOT USED |

Fig 7-6. 626-PA-6036 W/Opt 101
Mainframe Assy:
111243-G[] (rev D)

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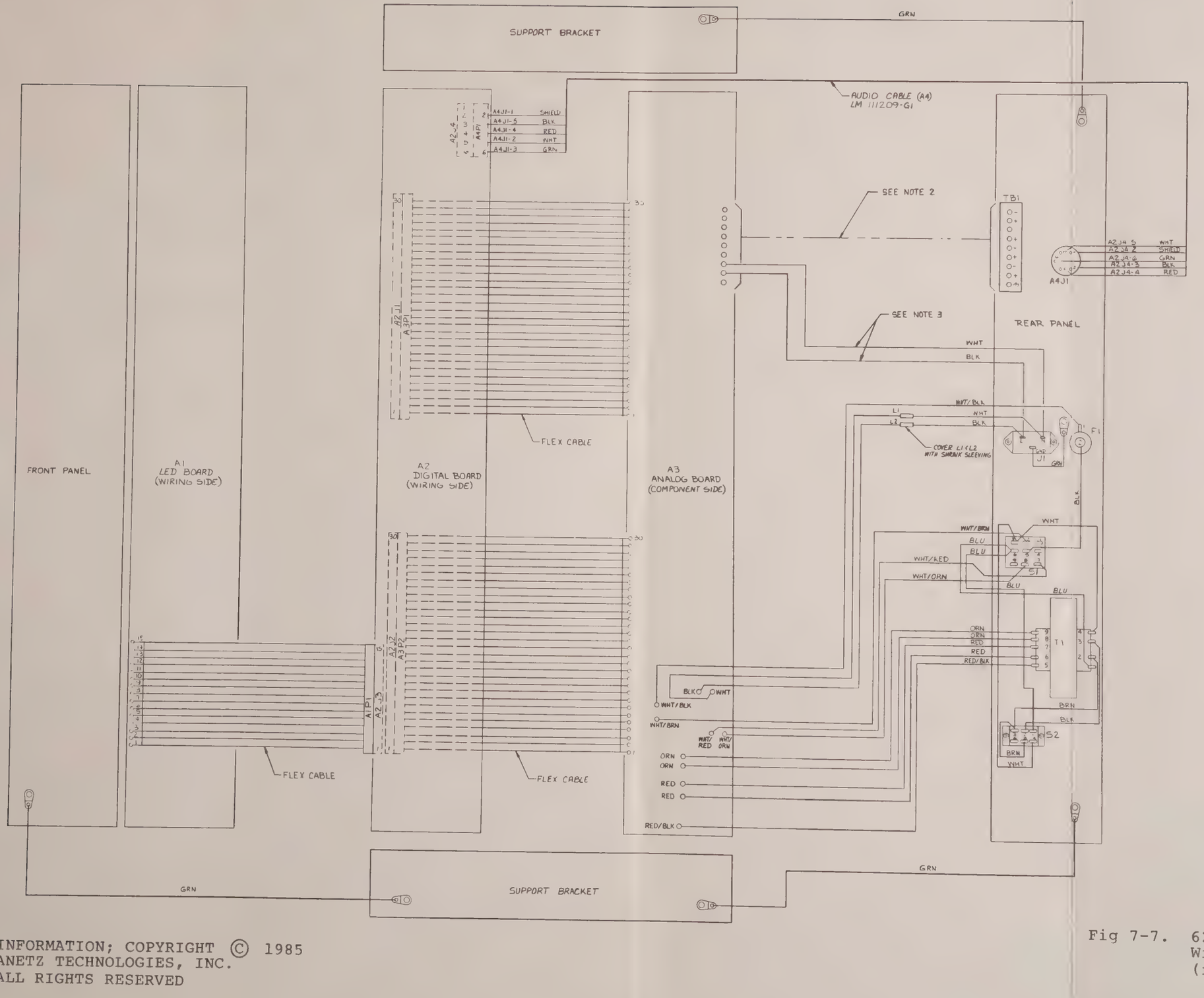


NOTES:
1. UNLESS OTHERWISE SPECIFIED ALL WIRE TO BE 18AWG
2. TB1 USED ON G2, G3 VERSION ONLY
3. WHT & BLK WIRES USED ON G1 VERSION ONLY

Fig 7-7. 626-RMU Interconnecting Wiring Diagram: 111202-G1 (rev C)

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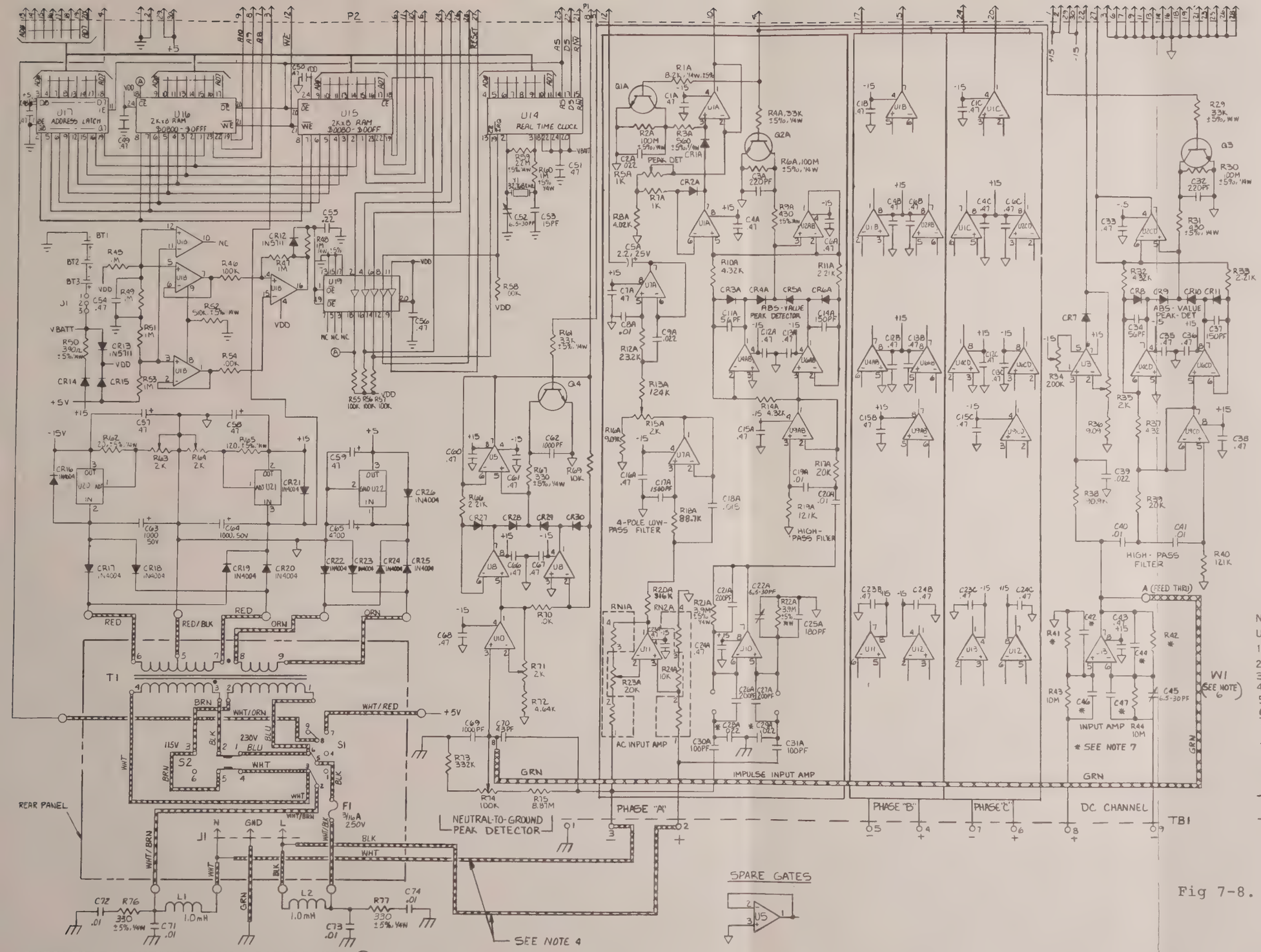


| | G1 | G2 | G3 |
|---|---|---|---|
| R41 | 3.32M | 3.32M | 432K |
| R42 | 3.32M | 3.32M | 432K |
| C42 | 300PF | 300PF | MATCHED PAIR 1000PF NOMINAL MATCH TO 1/2% |
| C44 | 300PF | 300PF | |
| C46 | 100PF | 100PF | MATCHED PAIR 43PF NOMINAL MATCH TO 1/2% |
| C47 | 75PF | 75PF | |

| I.C. CHART | | | | | | |
|---|---|---|---|---|---|---|
| DESIG | TYPE | +15 | -15 | +5 | GND | VDD |
| U1A,B,C | TL062 | 8 | 4 | | | |
| U2AB,U2CD | TL082 | 8 | 4 | | | |
| U3 | TL061 | 7 | 4 | | | |
| U4AB,U4CD | TL082 | 8 | 4 | | | |
| U5 | TL082 | 8 | 4 | | | |
| U6AB,U6CD | TL082 | 8 | 4 | | | |
| U7A,B,C | TL062 | 8 | 4 | | | |
| U8 | TL082 | 8 | 4 | | | |
| U9AB,U9CD | TL082 | 8 | 4 | | | |
| U10 | TL082 | 8 | 4 | | | |
| U11 | TL082 | 8 | 4 | | | |
| U12 | TL082 | 8 | 4 | | | |
| U13 | TL082 | 8 | 4 | | | |
| U14 | 6818 | | | | 12 | |
| U15 | 6116LP | | | | 12 | 24 |
| U16 | 6116LP | | | | 12 | 24 |
| U17 | 74C373 | | | 20 | 10 | |
| U18 | MC14575 | | | | 13 | 4 |
| U19 | 74C244 | | | | 10 | 20 |
| U20 | LM331T | | | | | |
| U21 | LM317T | | | | | |
| U22 | LM340T5 | | | | | |

NOTES:
UNLESS OTHERWISE SPECIFIED
1. RESISTANCE VALUES ARE IN OHMS n1cw, t 1%
2. CAPACITANCE VALUES ARE IN MICROFARADS
3. DIODES ARE IN4148
4. WHT + BLK WIRES FOR G1 ONLY
5. TRANSISTORS ARE 2N2222
6. W1 FOR G3 VERSION ONLY
7. SEE "G" LEVEL CHART FOR VALUES OF: R41, R42, C42, C44, C46 & C47.
- G1 = AS SHOWN WITH THE OMISSION OF PARTS IN PHASE B (EXCEPT FOR R6B, R9B, R14B, R19B, R23B, R24B, C6B, C12B, C13B, C15B, C23B, CR6B, CR3B, RN1B + RN2B), PHASE C AND DC CHANNEL, & W1.
- G2 = AS SHOWN, EXCEPT WIRES USED IN NOTE 4 & W1
- G3 = AS SHOWN EXCEPT WIRES USED IN NOTE 4, AND WITH THE OMISSION OF THE FOLLOWING PARTS: C69, C70, R73-R75 & C45.

Fig 7-8. Analog Bd Schem: Assy 111216-G[], Schem 111221-G[] (rev C)

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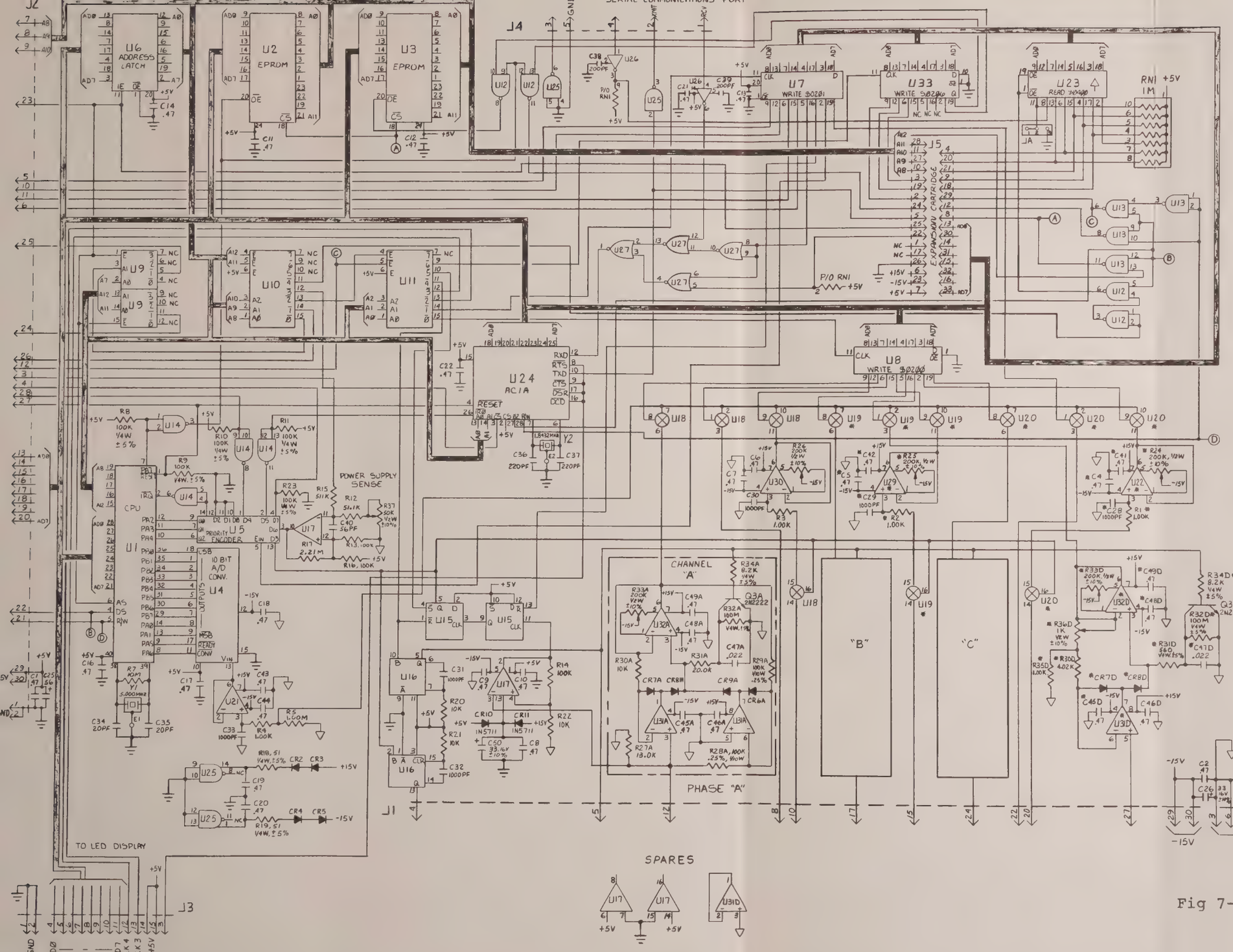


| DESIG | TYPE | +5V | GNDD | +15V | -15V | GNDA |
|---|---|---|---|---|---|---|
| U1 | 6805E2 | 40 | 20 | | | |
| U2,3 | 27C32 | 24 | 12 | | | |
| U4 | AD571 | 10 | 16 | | 12 | 14 |
| U5 | 4532 | 16 | 8 | | | |
| U6 | 74C373 | 20 | 10 | | | |
| U7,8,33 | 74C374 | 20 | 10 | | | |
| U9 | 74LS139 | 16 | 8 | | | |
| U10,11 | 74HC138 | 16 | 8 | | | |
| U12-14 | 74HC00 | 14 | 7 | | | |
| U15 | 74HC74 | 14 | 7 | | | |
| U16 | 74C221 | 16 | 8 | | | |
| U17 | HA-4905 | 1 | 9 | | 5 | |
| U18-20 | HI-201 | | | 13 | 4 | 5 |
| U21,32A-D | TL081 | | | 7 | 4 | |
| U22,29,30 | TL061 | | | 7 | 4 | |
| U23 | 74C244 | 20 | 10 | | | |
| U24 | R6551A | 15 | 1 | | | |
| U25 | SN75188 | | | 7 | | |
| U26 | SN75189 | 14 | 7 | | | |
| U27 | 74HC02 | 14 | 7 | | | |
| U31A-D | TL062 | | | 8 | 4 | |

Fig 7-9. Digital Bd Schem:
Assy 111210-G[],
Schem 111215-G[] (rev C)

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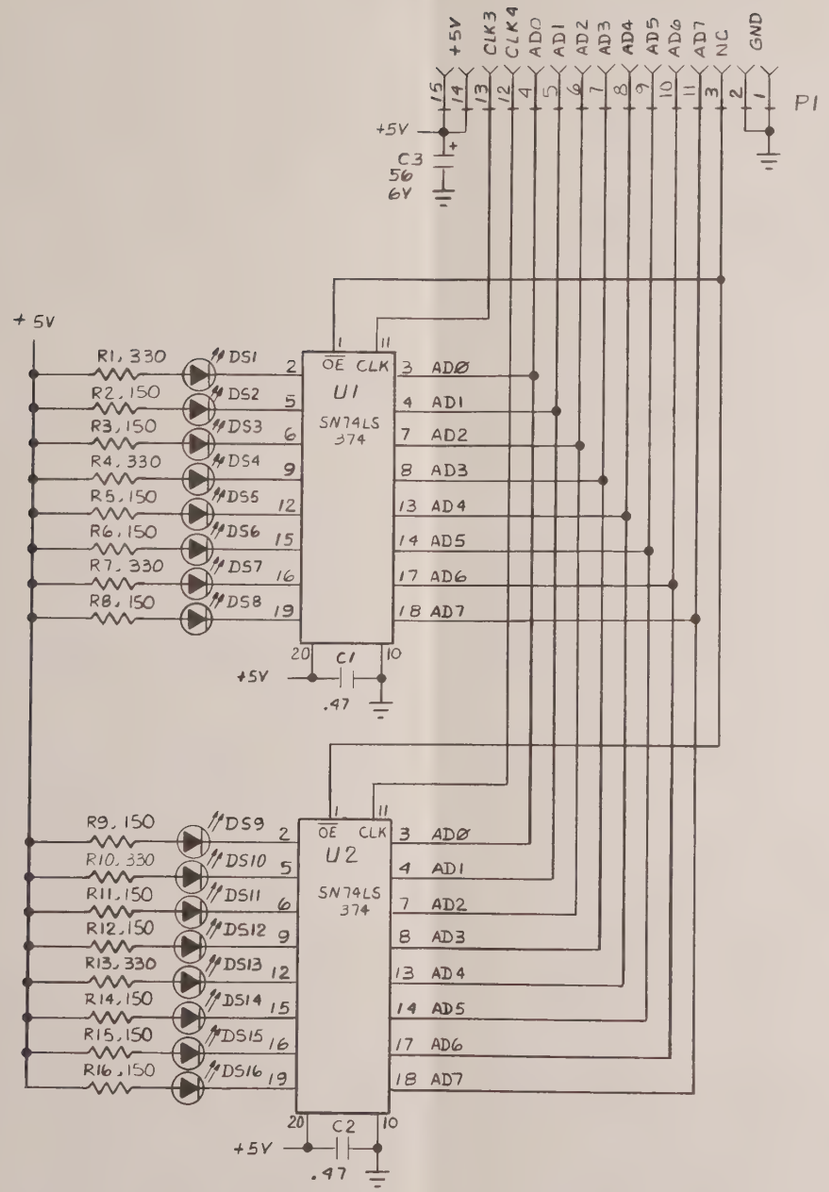


NOTES:

UNLESS OTHERWISE SPECIFIED:

1. RESISTANCE VALUES ARE IN OHMS, 1/4W, ± 5%.
2. CAPACITANCE VALUES ARE IN MICROFARADS
3. DS1, 4, 7, 10 & 13 ARE HLMP-0301 (RED)
   DS2, 5, 8, 11, & 14 ARE HLMP-0401 (YEL)
   DS3, 6, 9, 12, 15, & 16 ARE HLMP-0504 (GRN)

| "G" LEVEL TABLE | |
|---|---|
| "G" NO | NOT USED |
| -G1 | DS1-6, DS10-12<br>R1-6, R10-12 |
| -G2 | AS SHOWN |
| -G3 | DS13-15<br>R13-15 |

Fig 7-10. LED Indicator Bd Schem:
Assy 111222-G[],
Schem 111227-G[] (rev C)

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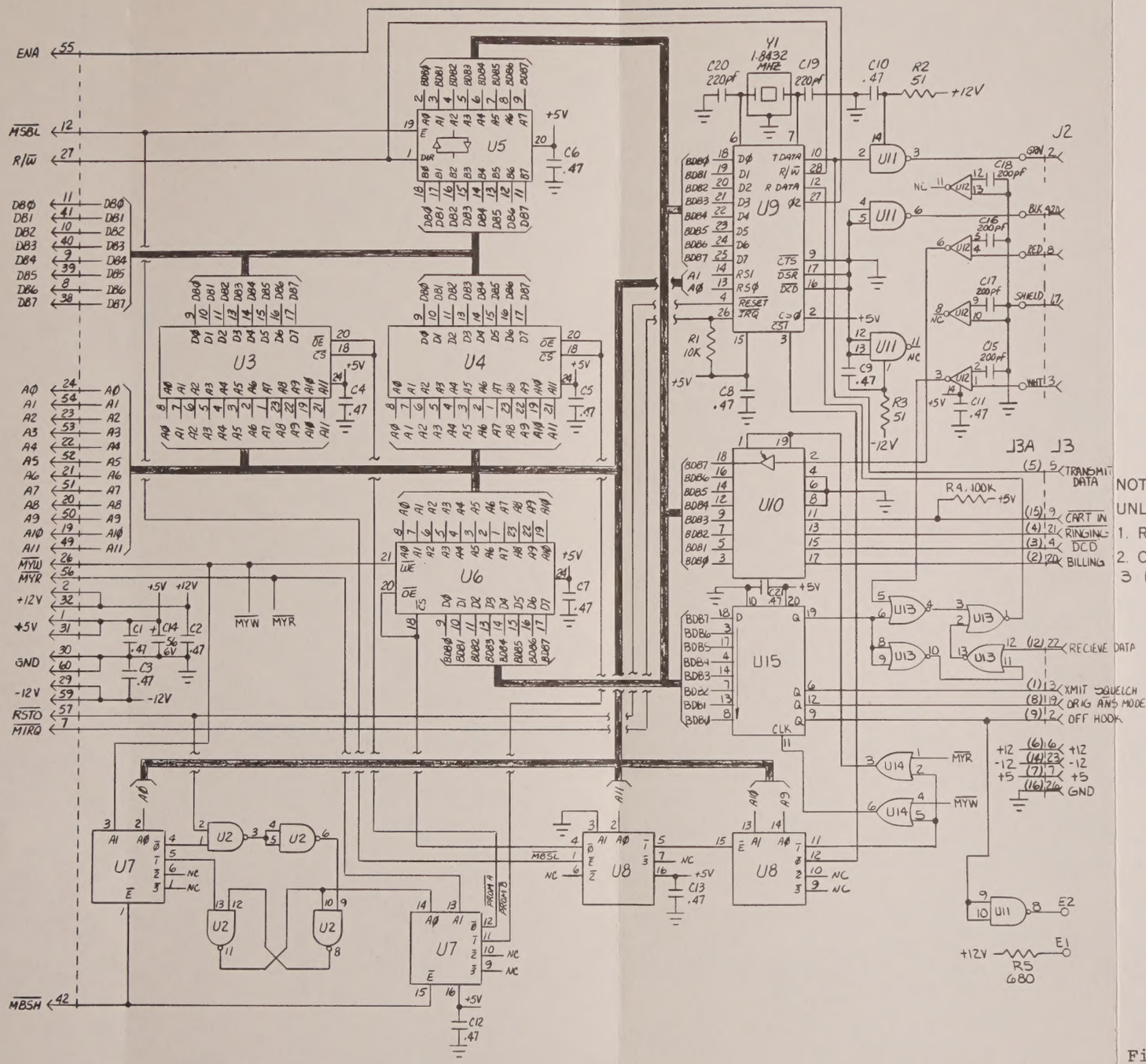


NOTES:

UNLESS OTHERWISE SPECIFIED:

1. RESISTANCE VALUES ARE IN OHMS ¼ W ± 5%
2. CAPACITANCE VALUES ARE IN MICROFARADS.
3. U4, U6, C5, C7 & J3 ARE NOT USED FOR G10RG2

| DESIG | TYPE | +5V | GND |
|---|---|---|---|
| U2 | 74HC00 | 14 | 7 |
| U3,U4 | 27C32 | 24 | 12 |
| U5 | 74HC245 | 20 | 10 |
| U6 | HM6116LP-4 | 24 | 12 |
| U7,U8 | 74HC139 | 16 | 8 |
| U9 | 6551AP | 15 | 1 |
| U10 | 74C244 | 20 | 10 |
| U11 | 75188 | - | 7 |
| U12 | 75189 | 14 | 7 |
| U13 | 74HC02 | 14 | 7 |
| U14 | 74HC32 | 14 | 7 |
| U15 | 74HC374 | 20 | 10 |

Fig 7-11. RMU Adapter Board (626-PA-6036 PC Bd) Schematic: Assy 111244-G[], Schem 111249-G[] (rev D)

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